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No. 48

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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 48

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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I. DEVELOPMENT AND PRODUCTION OF COMPUTERS AND CONTROL EQUIPMENT

A. Problem Areas

INTRODUCTION OF A PROCESS AUTOMATED MANAGEMENT SYSTEM AT THE NOVOLIPETSK METALLURGICAL PLANT

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, 1979 p 14

[Article by I. Frantsenyuk, plant director and V. Saklakov, chief, [Automated System of Management (ASU) Department]

[Excerpts] Automated management systems for technological processes (ASUTP) play an important role in increasing the effectiveness of production. Unfortunately, the practical achievements of standardization and mass ASUTP production are as yet modest. Take, for example, the Novolipetsk Metallurgical Plant, which occupies a leading position in ferrous metallurgy in terms of the introduction of ASUTP.

Process management systems are now at work here controlling 22 processes, performing over 50 individual functions, yielding a total annual savings of 2.6 million rubles to the plant. These systems require the operation of 25 control machines.

However, if we analyze the structure of the hardware and the software used, it is practically impossible to find a single unit or a single program module which could be transferred without change from one system to another. It is not surprising that the creation of each ASUTP required the expenditure of 100 to 150 man years of labor by workers in planning and scientific research organizations. No one is satisfied with this situation. The answer to the problem must lie in standardization.

Recently, our plant, in cooperation with other leading organizations involved in the development of ASUTP, such as the Institute of Automation (Kiev) and the Central Scientific Research Institute for Automatic Control (Moscow) begin work on the introduction of systems for industrial planning of ASUTP. The following planning procedure was used. The entire control algorithm was divided into functional-logical modules which repeat the maximum number of times in different systems. In creating any new system, the planners, in accordance with the control algorithm for the process, write specifications for program modules from among those available in the software bank, i.e., just as is now done with hardware--transducers and secondary instruments.

This, in our opinion, is one rather effective means of solving the problem. We believe that the experience of creation of an industrial system for the development of software for ASUTP is worthy of particular attention and support by the USSR State Committee for Science and Technology and by the USSR State Standards Organization.

We would like to discuss a few problems related to the provision of a technical and economic basis for ASUTP in the preplanning stage and determination of the actual economic effect of a system which has been introduced. The method of these calculations does not meet the requirements of today. It is not only the methodology, but the existing norms which are at fault, calling for introduction of the ASUTP after the technological process is operating.

The experience of various enterprises shows that the management system must be put on stream simultaneously with the controlled object for which the ASUTP is planned, as an inseparable part of the entire system. At our plant, a system for management of a highly productive transverse rolled product cutting unit has been planned and introduced in this manner. In 1979, systems for management of an etching machine, an "endless" cold rolling mill and other machines will be put on stream in this same manner. This will allow a significant increase in the economic effect achieved by the introduction of ASUTP. Of course, this approach increases the requirements placed on the reliability of hardware--transducers and computers. And, it must be said, complaints concerning the quality of the hardware are numerous. For example, most peripheral devices, magnetic disk memory units and computer terminal equipment are low in reliability. Serious complaints are also heard concerning technological transducers.
[384-6508]

6508
CSO: 1863

NEED FOR AUTOMATED MANAGEMENT SYSTEM EVALUATION CRITERIA

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, 1979 p 14

[Article by K. Shal'kov, chief, ASU Division, Barnaul' Tire Plant]

[Text] In our opinion, there are significant reserves available for increasing the effectiveness of ASU (automated management system) by introducing leading experience, improving the organization of their operation and the tasks which they perform. However, extensive utilization of these reserves is hindered by the fact that the system of indices includes none which can be used to judge the effectiveness of operation of an ASU. For example, the index "mean annual loading" in no way reflects the usefulness of the data produced. Let us assume, in one day a computer outputs 100 documents. If not a single one of these is used in production, the report index of mean annual loading will appear quite good.

If we keep in mind that computers are designed primarily to perform computation, it becomes obvious that one of the qualitative estimates of their operation must be the change in the level of mechanization of computational operations at the enterprise following introduction of the ASU. Systematic determination of this index would allow more precise determination of the role and usefulness of the ASU at the enterprise.

Existing ASU take upon themselves the performance of the functions of various control subdivisions and once more the sequence of determination of the effectiveness requires improvement. The reference materials which ASU departments use in great numbers, include the index "standard number of workers liberated." Doubtless, liberation of workers as a result of transfer of functions to the ASU department is not actually reported, since the ASU usually performs only a portion of the functions of any given subdivision. This question must be answered in cooperation with the Personnel and Wages Department, Laboratory for Scientific Organization of Labor, ASU department and the corresponding division of the enterprise, the functions of which have been taken on by the ASU. The operations related to redistribution of functions and numbers of persons in the administrative apparatus should be planned out.

And I would like to touch upon one more question. In our plant, the first section of the ASU was put on stream in 1976. In more than 2 years of operation, naturally, changes have occurred in the range of problems and operating programs, a result of the requirements of production. Why doesn't the Omsk ASU Planning and Design Office examine operating ASU's and provide the plant with suggestions for increasing their effectiveness? In our opinion this type of checking back on ASU operating in the enterprises should be performed by all system developers.

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6508

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B. Production Plants

BRIEFS

TABLE TERMINAL--Penza. In 1980 the "Schëtmash" plant began series production--of a table model terminal "Iskra-900." It consists of an electronic clock, a calendar, a telephone and a computing device. [Text] [Moscow IZVESTIYA in Russian 21 Oct 79 p 2] 9285
[52-9285]

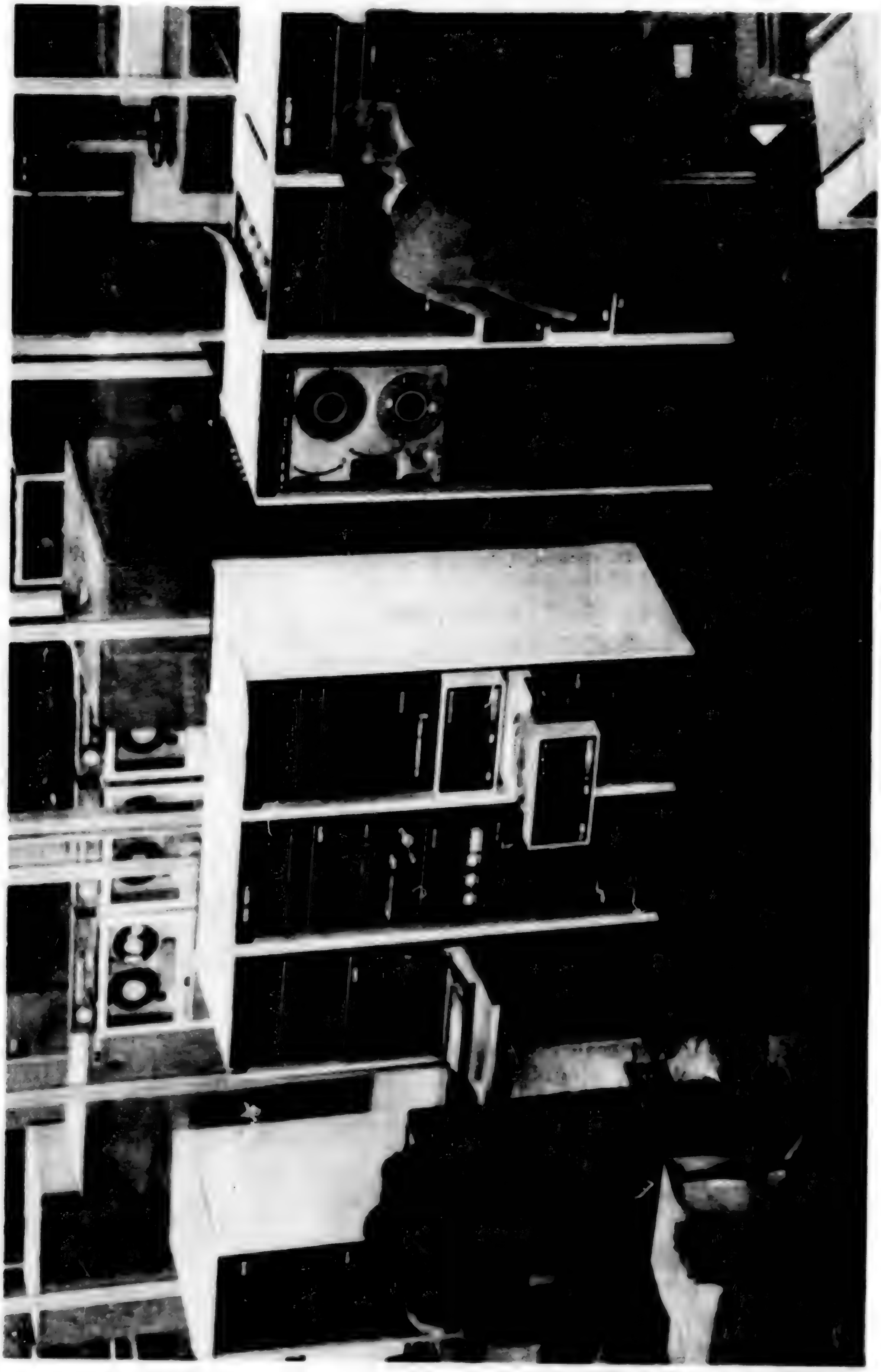
CSO: 1863

C. Unified System or Ryad Series

SM COMPUTERS EXHIBITED IN MOSCOW

Moscow RADIO in Russian No 9, 1979 p 1

[Abstract] The photograph shows SM computers being displayed at the Moscow exhibit "SM and YeS Computers and Their Applications."



[102]
CSO: 1863 - P

KEY-TO-TAPE DATA ENTRY AT MINISTRY OF AGRICULTURE

Moscow ZASHCHITA RASTENIY in Russian No 1, 1979 frontcover

[Excerpts] An automated management system for plant protection developed by the Central Scientific Research Forecasting Laboratory and the Main Computer Center of the Ministry of Agriculture will enter production this year.

Mounting magnetic tape.

Receiving bimonthly data on the spread of pests and plant disease.

Key-to-tape data entry at the Main Computer Center [top and bottom].

[50]

CSO: 1863-P

SM COMPUTERS FOR CONTROL SYSTEMS

Moscow SOVIET EXPORT in English No 2, 1979 pp 35-37

[Article by B. N. Naumov, Corresponding Member of the USSR Academy of Sciences, Director, Institute of Control Machines]

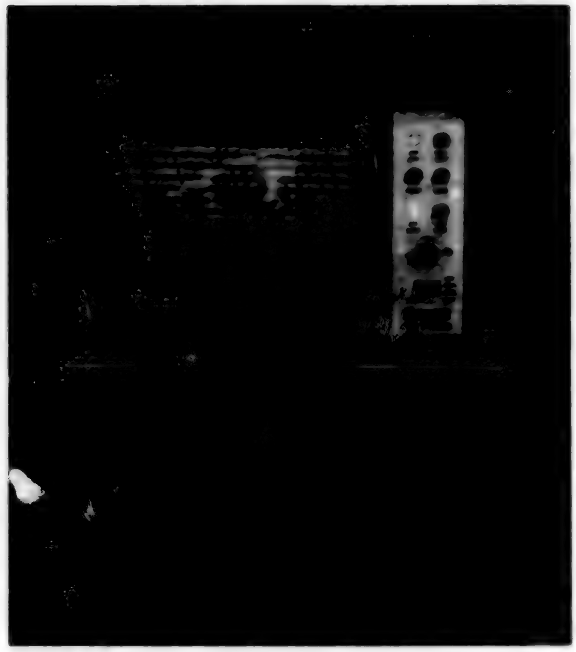
[Excerpts] A Product of Joint Effort

Uniformity in construction, components, technology and program facilities--these are the main principles underlying the design of the new series of control computer complexes. It is a joint project, developed by Bulgarian, Cuban, Czechoslovak, GDR, Hungarian, Polish, Romanian and Soviet specialists. The complexes are produced as part of the co-operation among socialist countries. The biggest producer of the complexes is the Soviet Union which has high-capacity computer factories in Kiev, Sverodonetsk and other cities. Poland is also making electronic computer complexes according to common specifications.

Factories of socialist countries are making peripherals of more than 200 types. Hungary, in particular, supplies the Soviet Union with display devices, Bulgaria supplies magnetic discs, the GDR and Poland produce printers, while Czechoslovakia produces facilities for the input and output of information on punched tape. The pooling of efforts has helped raise the standard of computing equipment. The designers drew on the experience accumulated by socialist countries, and also thoroughly analyzed similar equipment manufactured by firms in capitalist countries. The new complexes meet all the IEC standards and recommendations.

At present the first stage of a new electronic computer system is being manufactured. It comprises computers of four models--the SM-1, SM-2, SM-3 and SM-4. It also includes two different types of processors. These are compatible in the formats and codes used for input and output. Within each series, compatibility of the order sets passed from junior models to senior ones is provided for.

Physically, the processors are made as self-contained units and can be used in desk operation or build into a standard rack.



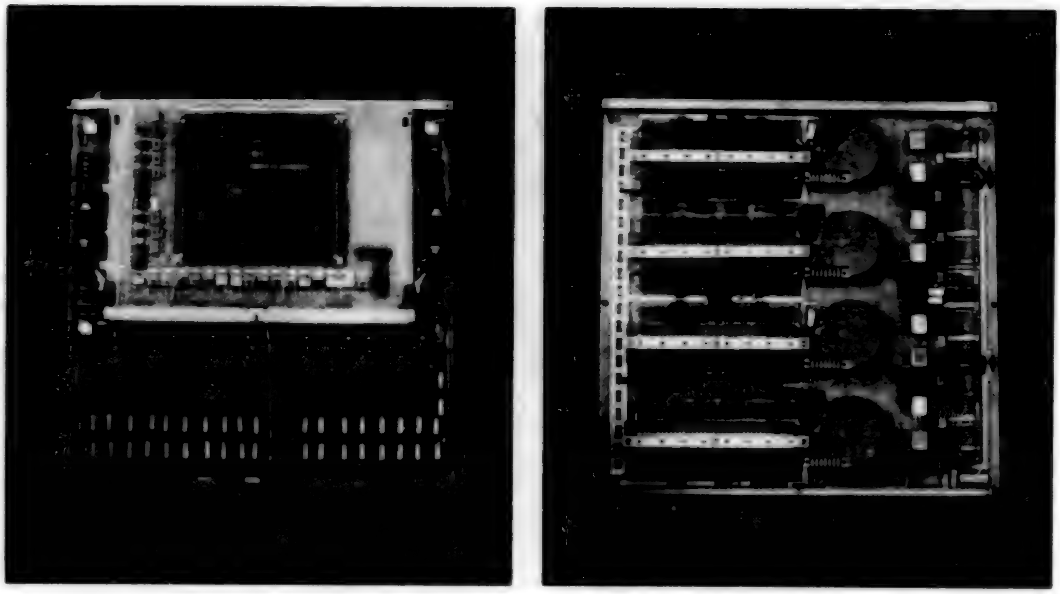
The models of the electronic computer systems of the second stage are now being developed. They are of the micro and megamini classes. They will complete the series of electronic computer complexes.

The applications of the new computers are most extensive: they can be used in the operation of machine tools and production lines, with sophisticated laboratory equipment, or for the control of research experiments and production processes.

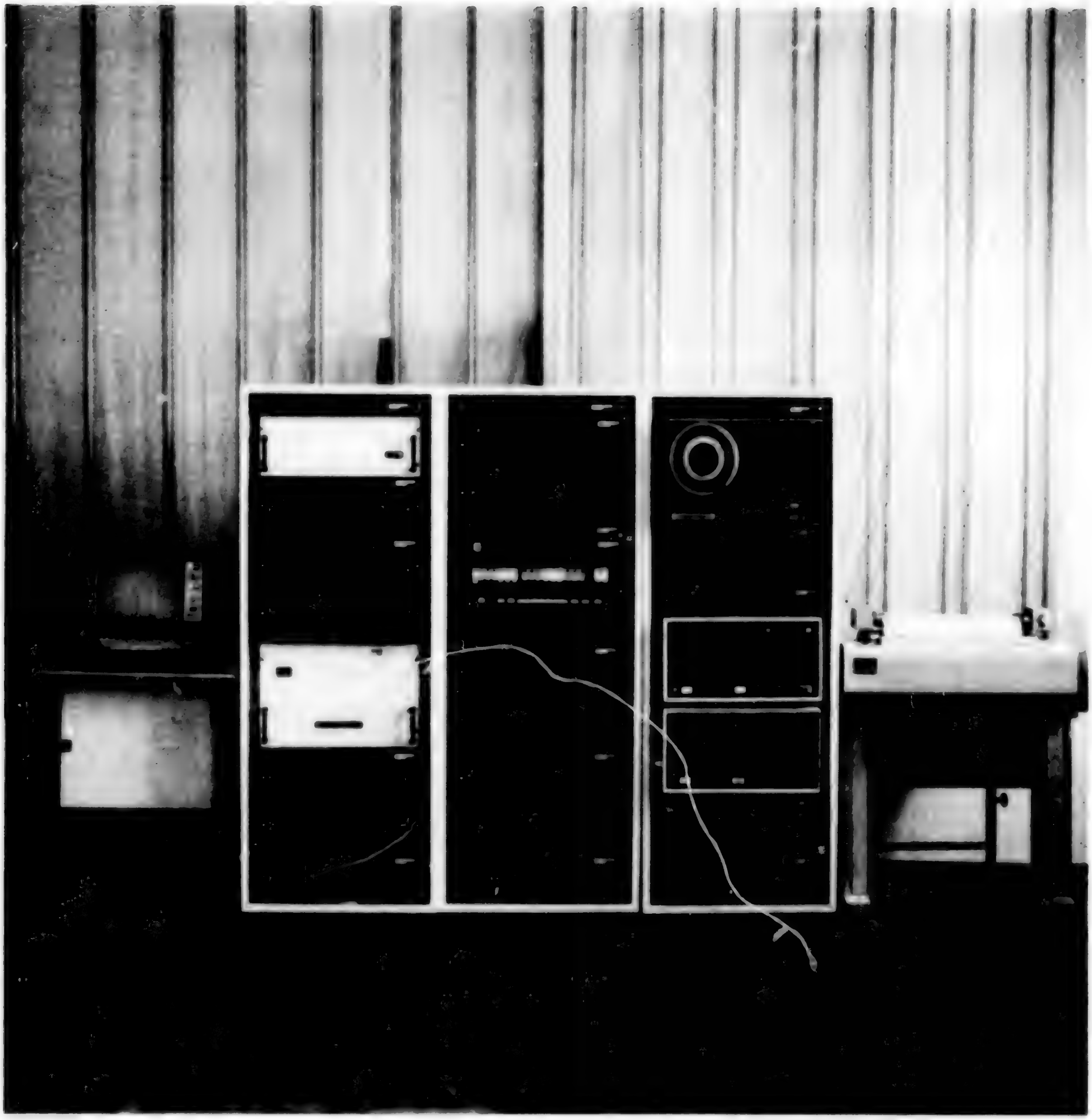
New Complexes Expand the Application of Automated Control Systems

The chief advantage of the electronic computer complexes is that they make possible a problem orientation which depends on the problems to be solved by the automatic control systems. The computers are technically perfect. They can carry out logical and arithmetical processing of symbols and 16 and 32 digit binary numbers with a fixed or floating point. It is especially important for control systems that the electronic computers should have a flexible multi-level priority interruption system, which ensures effective real-time computer operation. This makes possible operation in a multi-programme and time separation mode. The new complexes are oriented to the development of multi-processor systems and can be used for solving problems of any complexity. The development of special operating systems different from single-processor systems is not necessary.

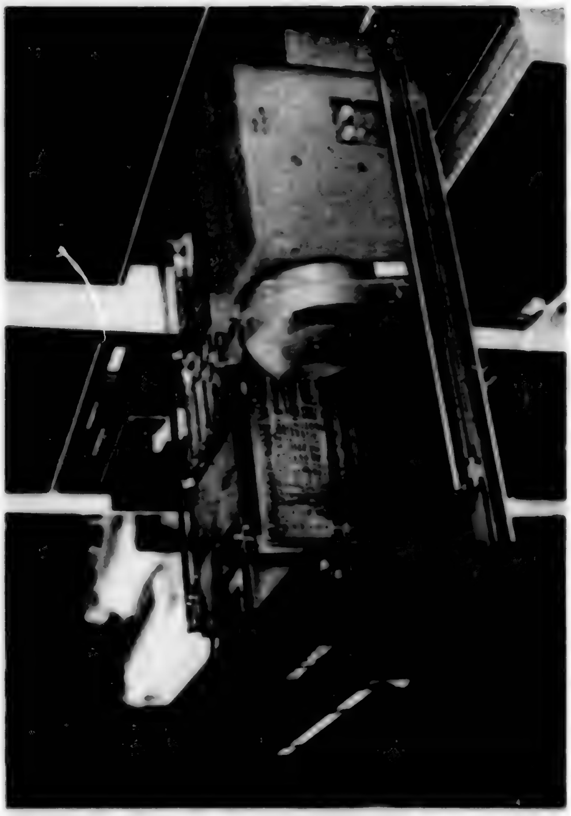
These computers give programmers a wide range of computing facilities--fast registers, various addressing systems and stack memory units. Memory protection with dynamic distribution and the provision of timers make it possible to organize various multi-programme modes of operation.

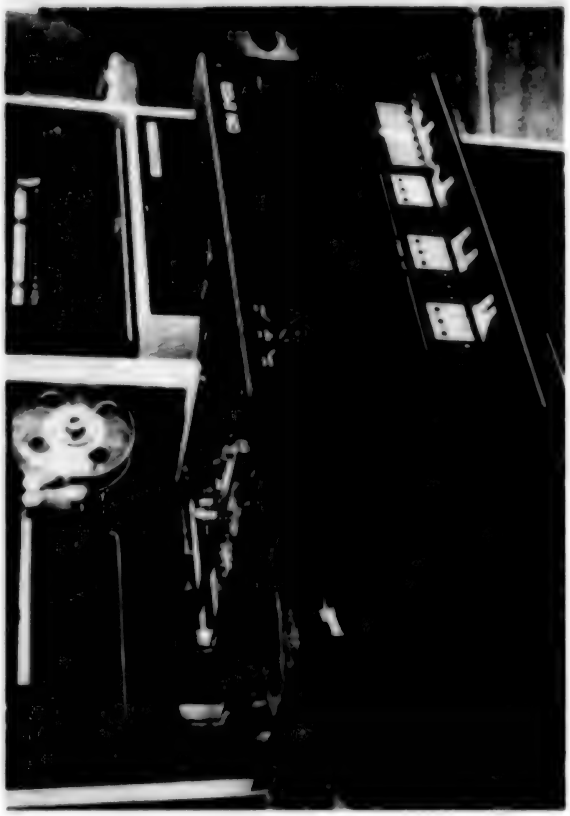


The circuit panel of the main ferrite-core memory with an access cycle of 1-1.2 μsec; the circuit panel of the control storage with an access cycle of 0.3 μsec.

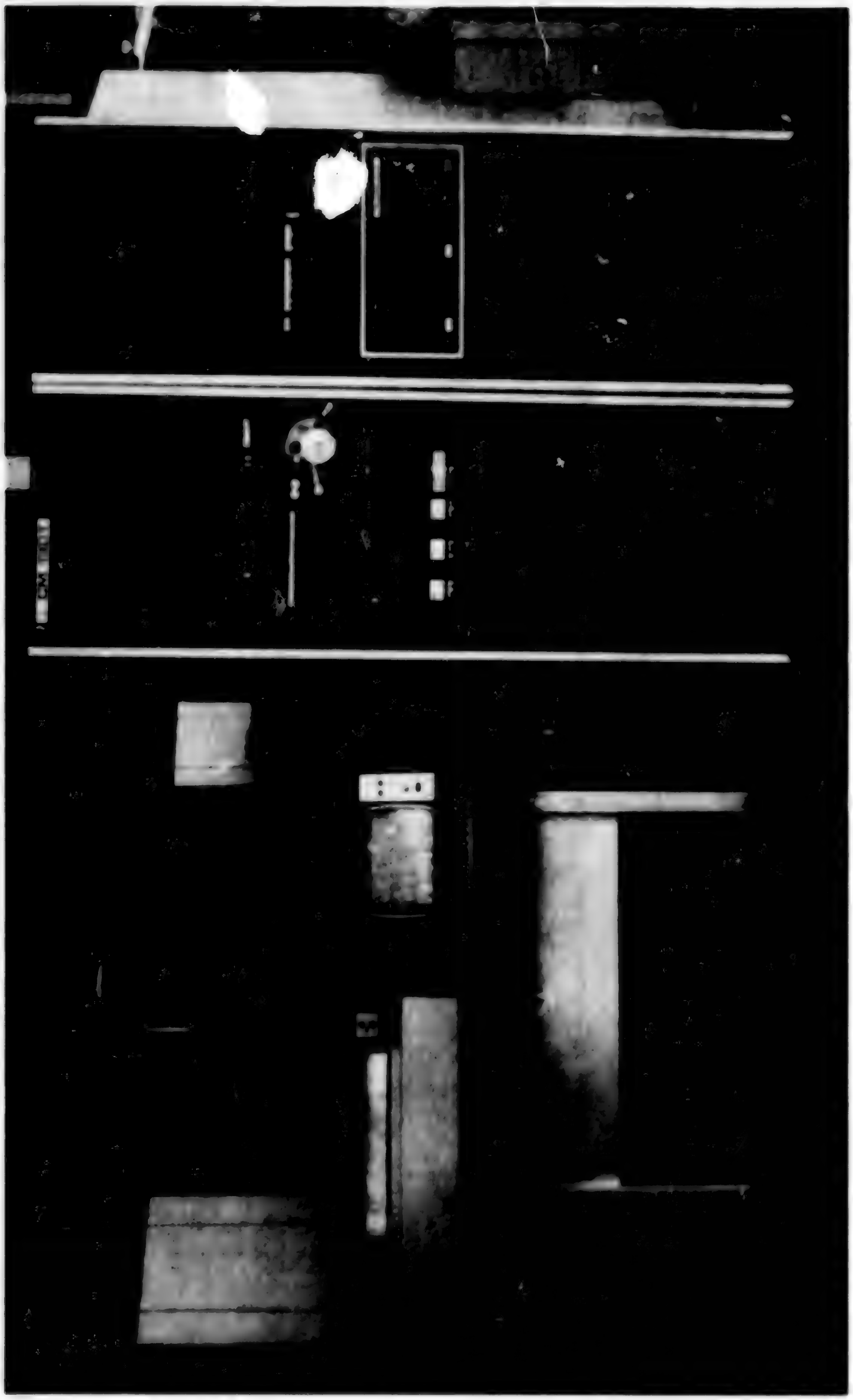


The SM-1 microprogram control computer with five control registers, a built-in direct-access channel, and the main memory with a capacity of up to 32 Kwords.





The SM-3P processor designed as a functional independent block with a built-in power pack; a magnetic disk controller making it possible to connect up to four disks with a total capacity of up to 19.2 Mbit to the computer.



The SM-3 microprogram controlling computer with a common-bus interface, eight versatile registers, stack memory of 32 Kwords (18-digit words), and a set of instructions for byte and bit data processing.

The programme facilities of the new controlling computer complexes consist of operating systems which do all the basic multi-programme jobs, process data in the pack, time-separation, real-time and dialogue modes, and carry out remote data processing. The translators make it possible to use the basic languages of high-level programming: FORTRAN, ALGOL, COBOL, BASIC, FOCAL. The problem oriented programme packs ensure the processing of technological information, graph data, data from laboratory experiments, economic calculations and carry out assignments connected with problem evaluation review technique. Methods of simulation modelling, optimization and mathematical statistics can be used.

The controlling electronic computers raise automated control systems to a new level. They make it possible to develop adaptive control systems and systems with built-in computers and to control moving objects. The automated control systems intended for production processes and research combine decentralization of control and regulation functions.

The module system of programming helps reduce the time required for programme planning in concrete control systems.

The new complexes are much more reliable than previous computers.
[77]

CSO: 1863-P

IZOTIMPEKS MAGNETIC DISKS

Kiev MEKHANIZATSIYS I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 3, 1979 outside back cover

[Advertisement by "Vneshtorgreklama"(Ministry of Foreign Trade Advertising)]

[Text] The "IZOTIMPEKS" Company offers computer users the YeS-5053, YeS-5261 and YeS-5269 and IZOT-5266 disk packets, manufactured with state of the art technology.

Main Technical Characteristics

Parameters	YeS-5053	YeS-5261	Ye -5269	IZOT-5266
Capacity, MB	7.25	29/58	2.45/5	100
Number of disks	6	11	1	12
Number of recording surfaces	10	20	2	20
Track density, TPI	100	100/200	100/200	200
Recording density, BPI	1100	2200	2200	4400
Compatibility with IBM or an equivalent (EV)	IBM 1311 or EV	IBM 2314 or EV	IBM 5440 or EV	IBM 3330
Specification	2864	3564	3562	4337

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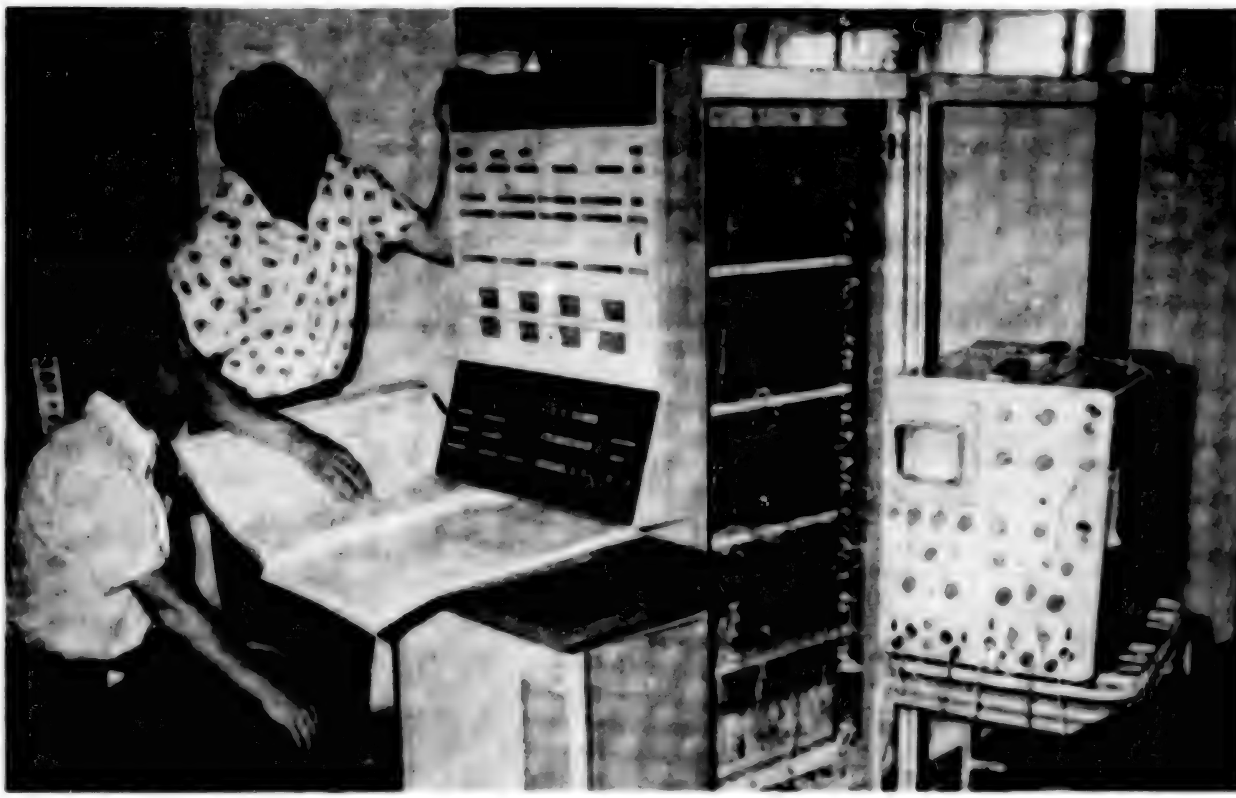
[45-8225]

8225
CSO: 1863

PHOTOGRAPH OF M4030-1 COMPUTER AND CONSOLE

Kiev UPRAVLYAYUSHCHIYA SISTEMY I MASHINY in Russian No 3, 1979 inside front cover

[Photograph; no caption given]



[422]

CSO: 1863

UDC 681.3.29./16

CHARACTERISTICS OF FLEXIBLE DISK STORAGE REVIEWED, COMPARED

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, 1979 manuscript received 23 Oct 78; after completion, 19 Dec 78 pp 62-68

[Article by A. V. Bogachev, G. S. Kolomiyets, and V. P. Fedotov: "Storage on Flexible Magnetic Disks"]

[Text] Introduction

The efficiency of operation of computing systems depends greatly on external memory devices and the quality of information media. It was comparatively recently that computing complexes based on minicomputers appeared with small storage units using standard 12.7-millimeter magnetic tape, which provides long-term archive storage. The 3.81-millimeter tape "compact" from the Philips Company (Holland) and the 6.35-millimeter "cartridge" tape from the U. S. firm of 3M are widely used cassette storage units. Rigid disks placed in a special cassette that is set on a drive spindle have become widespread for storage. The recent appearance of a new information medium, the flexible magnetic disk, has opened up broad opportunities for development of a highly reliable, efficient peripheral unit, the flexible magnetic disk store (FMDS). [Russian: NGMD].

Current Situation and Prospects for Development of the FMDS

Prerequisites and history of its creation. The possibility of distributed data processing greatly increased the demand for small systems with a concurrent, rapid enlargement of the main memory and disk stores used in them. The heightened demand for inexpensive disk stores with direct access, on the one hand, and the constant improvements in magnetic recording on the other led t the creation and rapid growth in the production and use of FMDS's.

The first FMDS was made by IBM (United States) during work on a large disk store project [1]. An inexpensive storage unit with high reliability and acceptable data input speed was needed to load programs to the control unit. It was suggested that lavsan magnetic tape glued to a foam plastic disk be used as the medium. The read-write head pressed

against the magnetic surface and the foam plastic provided an elastic backing. But difficulties in securing the necessary tolerances during the manufacture of the foam plastic disk made it necessary to discard the proposal, and the final solution was to put the flexible lavsan disk in a plastic case or cassette. The model 23FD, the first industrial prototype of a flexible magnetic disk store, was produced in this form in 1970.

Description and principle of operation. From the outside the flexible disk (or flexible cassette disk, floppy disk, or diskette) looks like a flexible phonograph record contained in a square plastic case or cassette.

The set of requirements for dimensions, mechanical characteristics, magnetic parameters, and format of flexible disks is established and recommended as a standard by the International Organization for Standardization (ISO) [2].

The basic elements of the standard cassette containing a flexible magnetic disk are the disk, lining, case, and envelope. The disk has enough rigidity to allow it to rotate inside the lined cassette, and at the same time sufficient flexibility to lie solidly against the read-write head.

The openings in the case are used to fix the disk to the drive spindle and to give the read-write head access to the recording area.

Magnetic signals are recorded on the surface of the disk by the frequency modulation (FM) method in 77 concentric tracks. On the inside track the longitudinal density of recording is 128 bits per millimeter. The crosswise density is about 1.9 tracks per millimeter. One side of a standard disk can record and store a total of 3.2 million bits of data.

The addresses of 26 sectors are entered on each track ahead of time. Each sector can contain 128 bytes of usable information, which provides storage of 256,256 bytes on one side of the disk.

In addition to the disk recommended by the ISO there are two other types of flexible disks with the same dimensions. The first is different because it has 32 holes on the internal diameter in addition to the index opening; this gives a fixed (hardware) division of the track into 32 sectors. Each sector also contains 128 bytes of information and 315,392 bytes can be stored on the 77 tracks.

The second type of disk for fixed division of the track into sectors has 32 holes on the outer diameter and provides storage of about 312,500 bytes of usable information on 64 tracks. These types are not interchangeable.

One more type of flexible disk has recently appeared, the minidisk. It is similar to the standard disk in design, but smaller in diameter with correspondingly fewer tracks (up to 40). The division of the tracks into sectors may be accomplished physically or by program; there may be 10, 16, or 18 sectors. Each sector can store 128 bytes, which makes it possible to store up to 89,128 bytes of usable information on such a disk.

The designs of different flexible magnetic disk stores may vary, but the working principle remains the same. The cassette containing the disk is put in working position. When the lid is closed the disk is centered on the drive spindle, causing the disk to rotate inside the cassette. The surface of the disk at this time is pressed away from the read-write head. To reduce wear on the head and disk the disk is usually pressed against the head only during performance of read or write operations.

The necessary track is selected by shifting the read-write head to an indicated address.

State of production. Principal characteristics. The FMDS won general recognition less than five years ago. At the present time about 100 different models had been developed which differ by design and certain technical parameters. Table 1 below gives the characteristics of the most representative models, reflecting development of the sector [3, 4].

Three generations of FMDS's may be tentatively identified. The first (1970) would include models that store up to 1.4 million bits of data, revolve at 90 rpm, and have an average access time of about 1.5 seconds.

In the second generation (1973) stores appeared with memory capacity of 3.2/6.4 million bits, disk rotation speed of 360 rpm, and average access time of 0.2-0.5 seconds. The capacity of 6.4 million bits was achieved either by doubling the density or by using two disks on one drive. The FMDS's appearing in 1977 with a read-write head on each surface of the disk may also be classified with this generation. This design provides memory capacity of 6.4/12.8 million bits.

The third generation includes the so-called mini-FMDS's that appeared in 1977. They have memory capacity of 875,000 bytes, rotational speed of 300 rpm, and average access time of about 0.4 seconds. Their dimensions and cost are about half that of standard units.

Table 1 gives a fairly complete picture of the principal characteristics of the FMDS's of all generations. For second-generation FMDS's we will look in more detail at information capacity, a target index. The full capacity of one disk surface is 3.2 million bits. But as a rule, flexible disks come with the tracks divided into sectors. The figure shows the arrangement of information on a track. The beginning of the track is marked by the signal INDEKS, which the detector detects each time the disk revolves.

Table 1. Principal Technical Characteristics of Selectable Magnetic Disk Stores

Параметры (a)	SENTURY 110 (b) (США)	BASF 6. 101 (c) (ФРГ)	LOGABAX PL×45D (d) (Франция)	SHUGART SA 400 (e) (США)
Плотность записи: (f)				
продольная, бит/мм (f1)	69	128	128	100
поперечная, дорожек/мм (f2)	2,5	1,9	1,9	—
Распределение памяти: (g)				
емкость привода, Мбит (g1)	1,44	3,1	6,4	0,875
дисков на приводе (g2)	1	1	2	1
записываемых поверхностей (g3)	1	1	4*	1
дорожек на поверхности (g4)	64	77	77	35
секторов аппаратно (g5)	8	32		16
секторов программно (g6)	—	26	26	18
Быстродействие: (h)				
переход на одну дорожку, мс (h1)	40	6	2,5	30
среднее время ожидания, мс (h2)	333,3	83	83	100
среднее время доступа, мс (h3)	1600	383	190	370
скорость передачи, Кбит/с (h4)	33,8	250	250	125
Надежность: (i)				
наработка на отказ, часов (i1)	—	6000	3000	—
наработка на сбой, бит/сбой (i2)	—	10^9	10^9	
срок службы головки, часов (i3)	—	15000	10000	—
срок службы носителя, проходов по одной дорожке (i4)	—	$5 \cdot 10^6$	$5 \cdot 10^6$	$3 \cdot 10^6$
Габариты, мм (j)	—	220×110×360	310×220×342	145×83×205
Вес, кг (k)	—	6,3	9,0	1,3
Потребляемая мощность, ВА (l)	—	98	150	—

Key:
- (a) Parameters;
- (b) Sentury 110 (United States);
- (c) BASS 6. 101 (West Germany);
- (d) Logabax PL×45D (France);
- (e) Shugart SA 400 (United States);
- (f) Density of Recording
    - (f1) Longitudinal, bytes per millimeter;
    - (f2) Crosswise, tracks per millimeter;
- (g) Distribution of Memory
    - (g1) Drive Capacity, millions of bytes;
    - (g2) Disks on Drive;
    - (g3) Surfaces Recorded;
    - (g4) Tracks on Surface;
    - (g5) Sectors by Hardware Means;
    - (g6) Sectors by Program Means;

(Continued on next page)

(Table 1 continued)

- (h) Speed
  - (h1) Switch to One Track, milliseconds;
  - (h2) Average Waiting Time, milliseconds;
  - (h3) Average Access Time, milliseconds;
  - (h4) Transfer Speed, thousands of bits per second;
- (i) Reliability
  - (i1) Hours of Work per Malfunction;
  - (i2) Working Time Until Breakdown, bits per breakdown;
  - (i3) Service Life of Head, hours;
  - (i4) Service Life of Medium, passages on one track;
- (j) Dimensions, millimeters;
- (k) Weight, kilograms;
- (l) Power Consumed, volts-amperes.

* Two surfaces are accessible after manually turning the disk.

Thus, each sector contains 128 bytes of data, that is, the usable capacity of a track is 3,328 bytes, about 70 percent of the total capacity. The usable capacity of one disk surface is 256,256 bytes. But the tracks in memory devices are usually used as follows. Track 00 is assigned for description of information on the disk. Tracks 74 and 75 are reserved and track 76 is not used The capacity of one disk surface is approximately 242,000 bytes.

In some applications a format that differs from the standard one is used. The user himself establishes the format by means of a program or a rigid division of tracks into 10, 16, 18, and 32 sectors. This increases the use efficiency of the medium to 90-95 percent.

Flexible magnetic disk stores of the CEMA countries. Many of the CEMA countries today have begun to produce FMDS's. Information on the technical and operations parameters of the the disks are given in Table 2 below.**

The PL*45 D.2 model has two flexible disks on a common drive, and offers the possibility of using two sides of the medium by manually turning the disk. Reading and writing may be accomplished at any moment on just one surface of the disk because the positioning mechanism and electrical circuits are shared by both heads. Thus, the PL*45D.2 store affords program access to information with a total volume of up to 6.4 million bits and allows storage of up to 12.8 million bits.

The signals of the PL*45D.2 interface differ from the signals of the interface of single-disk stores only by the presence of additional signals to organize access to two disks.

The format for recording on tracks for all the models shown in Table 2 is arbitrary with division into sectors by program means. But, as a rule, they all use media prepared in accordance with the standard ISO format in advance (see Figure).

** Models MF 3200, KONSUL-7112 and YeS-5074 are single disk units, which use one side of a standard disk. Their interface signals are identical and conform with the CEMA standard.

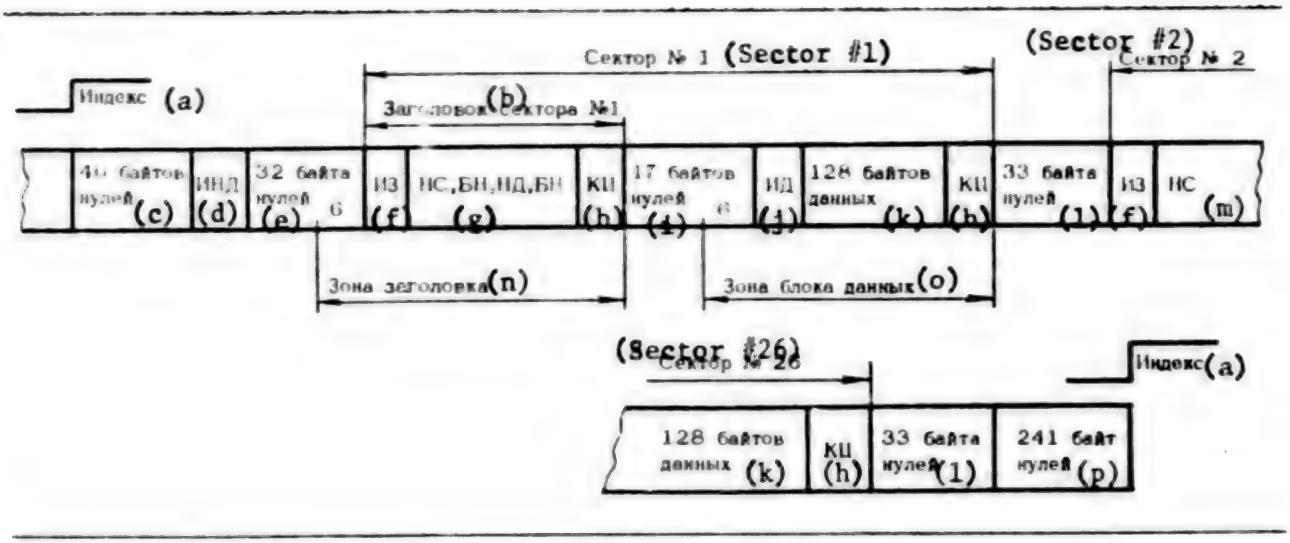


Figure. Format of Recording on a Track (length of each marker and cyclical monitoring code is one byte).

Key:
- (a) Index;
- (b) Head of Sector M1;
- (c) 46 Bytes of Zeroes;
- (d) Marker for Beginning of Track:
- (e) 32 Bytes of Zeroes;
- (f) Marker of Sector Head;
- (g) Sector Number, Zero Byte, Track Number, Zero Byte;
- (h) Cyclical Monitoring Code;
- (i) 17 Bytes of Zeroes;
- (j) Data Marker;
- (k) 128 Bytes of Data;
- (l) 33 Bytes of Zeroes;
- (m) Sector Number;
- (n) Head Zone;
- (o) Data Block Zone;
- (p) 241 Bytes of Zeroes.

Trends in development. The purposes of the development or modernization of memory devices in general are to increase information capacity and speed up data transmission, reduce data access time, increase the reliability and authenticity of data, and cut the cost of storage per bit.

Let us consider improvement and development of new FMDS's from this point of view.

Enlargement of information capacity is achieved primarily by recording on two sides of the medium. In this case the memory volume increases

Table 2. Characteristics of Flexible Magnetic Disk Stores Produced in the CEMA Countries.

Параметры (a)	(b) МФ 3200 (ВНР)	(c) «Консул-7112» (ЧССР)	ЕС-5074 (НРБ) (d)	(e) RLX45D.2 (ПНР)
Емкости дорожки: (f)				
общая, бит (f1)	41664	41500	41600	41664
формат *ISO*, Кбайт (f2)	3,328	3,328	3,328	3,328
Количество дорожек на поверхности (g)	77	77	77	77
Емкость поверхности: (h)				
общая, Мбит (h1)	3,22	3,2	3,2	3,2
формат *ISO*, Кбайт (h2)	256,256	256,256	256,256	256,256
Количество доступных поверхностей (i)	1	1	1	2*
Скорость вращения диска, об/мин (j)	360	360	360	360
Скорость передачи данных, Кбит/с (k)	250	250	250	250
Время перехода на одну дорожку, мс (l)	10	10	10	2,5/5,0
Время успокоения головки, мс (m)	25	25	25	30
Время нагрузки головки, мс (n)	40	40	—	90
Среднее время доступа, мс (o)	498	498	498	210/308
Метод записи (p)	*FM*	*FM*	*FM*	*FM*
Продольная плотность, бит/мм (q)	128	128	128	128
Габариты, мм (r)	217×134×375	250×200×400	230×133×400	310×220×342
Вес, кг (s)	8	8	10	10
Положение установки (t)	(dd) любое	(dd) любое	(dd) любое	(ee) вертикальное
Электропитание (u)				
переменное напряжение, В (u1)	220^{+10}_{-15}%	220^{+10}_{-15}%	220^{+10}_{-15}%	220^{+10}_{-15}%
частота, Гц (u2)	50∓1	50∓1	50±1	50∓1
постоянное напряжение, В (u3)	+5; −5; +24	+5; −5; +27	+5; −5; +24	+5; −6; +12; +24/48;
Потребляемая мощность, ВА (v)	120	140	110	210
Наработка на отказ, часов (w)	2000	1500	2000	2000
Наработка на сбой, бит (x)	10^9	10^9	10^9	10^9
Среднее время восстановления, часов (y)	0,5	0,5	0,5	0,5
Коэффициент технического использования (z)	0,99	0,95	0,97	0,97
Уровень звука при работе, дБ (aa)	65	65	65	70
Условия эксплуатации (bb)				
температура, °C (bb1)	5÷55	5÷40	5÷40	5÷45
влажность, % (bb2)	40÷90	20÷95	до 95	30÷90
атмосферное давление, мм рт. ст. (bb3)	630÷800	630÷800	630÷800	630÷800
Условия транспортирования (cc)	−50÷+60	−50÷+50	−50÷+50	−50÷+60
температура, °C (bb 1)				
влажность, % (bb 2)	до 95	до 95	до 95	до 95
атмосферное давление, мм рт. ст. (bb 3)	630÷800	630÷800	630÷800	630÷800

Key: (a) Parameters;
(b) MF 3200 (Hungary);

(Continued on next page)

(Table 2 continued)

(c) Konsul-7112 (Czechoslovakia);
(d) YeS-5074 (Bulgaria);
(e) PL×45D.2 (Poland);
(f) Track Capacity
  (f1) Total, bit;
  (f2) ISO Format, thousands of bytes;
(g) Number of Tracks on Surface;
(h) Capacity of Surface
  (h1) Total, millions of bits;
  (h2) ISO Format, thousands of bytes;
(i) Number of Accessible Surfaces;
(j) Speed of Disk Rotation, rpm;
(k) Speed of Data Transfer, thousands of bits per second;
(l) Switching Time to One Track, milliseconds;
(m) Head Settle Time, milliseconds;
(n) Head Engage Time, milliseconds;
(o) Average Access Time, milliseconds;
(p) Recording Technique;
(q) Longitudinal Density, bits per millimeter;
(r) Dimensions, millimeters;
(s) Weight, kilograms;
(t) Placement Position;
(u) Power Supply
  (u1) AC Voltage, volts;
  (u2) Frequency, hertz;
  (u3) DC Voltage, volts;
(v) Power Intake, volts-amperes;
(w) Hours of Operation until Malfunction;
(x) Working Time until Breakdown, bit;
(y) Average Restoration Time, hours;
(z) Technical Use Coefficient;
(aa) Sound Level During Operation, decibels;
(bb) Operating Conditions
  (bb1) Temperature, degrees C;
  (bb2) Humidity, percentage;
  (bb3) Atmospheric Pressure, millimeters mercury column;
(cc) Transporting Conditions;
(dd) Frontal;
(ee) Vertical.

* Requires manual turning.

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to 6.4 million bits, but the "second half" of the data is accessible only after manually turning the disk, which is the same thing as putting in another one. FMDS's with two heads do not have this problem. The design of the positioner makes it possible to set and move the two read-write heads at the same time on either side of the disk.

A second way to increase capacity is to double the longitudinal density of recording, which provides storage of 6.4 million bits of data on one surface of the disk.

Several models of FMDS's have been developed and are being produced with disk capacity of 12.8 million bits using doubled recording density (256 bits per millimeter) and two sides of the medium simultaneously.

In the future it will probably be possible to increase recording density only by reducing the thickness of the magnetic coding of the disk and by using fine-film heads, called "integral" heads. The relatively small dimensions make it possible to place them quite close to one another, which insures manufacture of a multitrack block of heads. In this case positioning of the heads is eliminated simultaneously with the increase in crosswise recording density and selection of the track is done by electronic circuit switching. Specialists estimate that this will make it possible to reach a longitudinal density of 396 bits per millimeter and a crosswise density of 40 tracks per millimeter in the near future [5].

Automatic disk loading into the storage unit is one of the ways of increasing the capacity of memory systems using flexible disks. For example, the West German BASF Company suggests the model 6110 RAL loader for the model 6101 flexible magnetic disk store. This loader selects one of 32 disks and puts it in working position. Thus, the maximum memory capacity is 102.4 million bits with an average access timed to the sector of 3.9 seconds.

There are two ways to increase the speed of data transmission. On the one hand, an increase in longitudinal recording density increases the speed of transmission with standard rotational speed, while on the other hand the speed of transmission increases with an increase in the speed of disk rotation. Thus, the disk in the FMDS produced by the Matsushita Company of Japan rotates at a speed of 1,800 rpm, which gives a data transmission speed of 1.1 million bits per second.

Reducing average access time involves significant technological difficulties in improving the characteristics of step motors. Only the use of multitrack read-write heads permits a significant reduction of this parameter. In the FMDS mentioned above from the Matsushita Company, the use of a separate head for each track made it possible to reach an average access time of 16.67 milliseconds.

The chief way envisioned to improve the reliability of FMDS's is increasing the service life of both the recording medium and the read-write head. There are two ways to do this also. The simplest way is to use stronger materials. Various new developments have switched to ferroceramic heads, making it possible to increase service life to 30,000 hours. A more complex but efficient way is to use the contactless recording technique. When a block of heads on one platform is used it is possible to insure a stable clearance between the head and the medium with very small expenditures and thus increase the service life of the head and the medium almost without limit.

The price of FMDS's today has been reduced 40-50 percent, primarily by improving production technology. In likelihood it will remain at the level of $400-$600 for an FMDS with a capacity of 3.2-6.4 million bits. The appearance of miniature FMDS's cut the price in half, but memory capacity in this case was reduced by about two-thirds.

Purpose and Area of Application

Comparison with traditional media. The advantage of flexible disks over traditional data input means (punched cards and tape) needs no special proof. One standard flexible disk replaces 3,000 punched cards or 800 meters of punched tape, and it can be used many times. Moreover, expenditures for the medium and for its storage and transportation are much lower.

The productivity of present-day traditional data input devices lies in the range 100-2,000 bytes per second for punched tape and 250-2,500 bytes per second for punched cards. This index is 31,500 bytes per second for FMDS's. The price of FMDS's is less than the cost of punched card and punched tape equipment. Moreover, additional equipment equal in complexity and cost to a reader is required to record information on a traditional medium. For the flexible disk, like various other magnetic media, information reading and writing is performed by the same device.

When the flexible disk is compared with magnetic media it should be observed that magnetic cards on strips are considerably inferior in characteristics and the equipment needed to use them is more complex to manufacture and operate as well as more costly.

Table 3 below gives the average characteristics of certain magnetic media. It can be seen from this table that in terms of characteristics (above all productivity), the flexible disk occupies an intermediate position between casette tape and the rigid casette disk.

If the flexible disk is considered as a data input medium, it is easy to identify its advantages compared to other magnetic media. A comparison with the rigid cassette disk shows that the flexible disk has lower cost and is more compact. The cassette magnetic tape is most competitive with the flexible disk, but its input speed is 50,000 bits per second compared to 500,000 for the flexible disk. Thus, speed with low data storage cost is the principal advantage of the flexible disk as a data input medium.

As external memory the FMDS is inferior to other disk devices in speed, but costs considerably less; for many applications (above all for microcomputers) this is decisive. The presence of random access to information makes it possible to use a flexible disk in a direct access mode, which is practically impossible for tape media. Thus, to retrieve information placed in the middle of a cassette tape from the Philips (Holland) Company in magnetic tape cassette stores takes 120 seconds, and for the 3M (United States) cassette it takes 15 seconds. This operation can be performed in 0.2 seconds in an FMDS. Thus, short

(a) Тип носителя	(b) Емкость носителя, М бит	(c) Среднее время доступа, с	(d) Скорость передачи, К бит/с	(e) Стоимость хранения бита информации, коп
Стандартная магнитная лента (f)	40÷320	200÷400	20÷480	$0{,}5\times10^{-4}$
Кассетный жесткий диск (g)	20÷100	0,035÷0,08	2400÷8000	100×10^{-4}
Магнитная лента в кассете фирмы *Philips* (Голландия) (h)	6÷16	100÷150	10÷20	$1{,}5\times10^{-4}$
Магнитная лента в кассете фирмы *3M* (США) (i)	24÷80	10÷20	30÷50	$0{,}75\times10^{-4}$
Гибкий диск (j)	3÷12	0,2÷0,5	250÷500	$3{,}25\times10^{-4}$

Table 3. Comparative Characteristics of Magnetic Media

Key:
(a) Type of Medium;
(b) Capacity of Medium, millions of bits;
(c) Average Access Time, seconds;
(d) Speed of Transmission, thousands of bits per second;
(e) Cost of Storage of a Bit of Information, kopecks;
(f) Standard Magnetic Tape;
(g) Rigid Cassette Disks;
(h) Magnetic Disk in Philips Cassette (Holland);
(i) Magnetic Tape in 3M Cassette (United States);
(j) Flexible Disk.

access time is the chief advantage of the flexible disk over all tape media when used in external memory.

Comparison with other promising data storage media. Among the promising areas deserving attention are projects to devise memory units using instruments with charge couplings and magnetic domain. This is because their production is based on the technology of integrated circuits, which is the key technology in building computer equipment.

Although they have high potential speed (1-10 microseconds), charge-coupling memory devices cannot be a serious substitute for magnetic disks because the principle of data storage in them does not permit information to be preserved when the power supply is cut off. Another, although less critical, limitation is the fact that the need to maintain a minimum size of the charged domain of five microns limits the capacity of a crystal to 100,000 cells. As a result, the capacity of the charged-coupling storage unit may reach 10^8 bits, which is comparable to flexible disks, although the latter cost much less.

Memory devices on magnetic domains, either flat or cylindrical, are a more serious competitor to disk memory [6]. The storage unit on flat magnetic domains has a capacity limitation in principle to 10^7 bits and is not interesting. The storage unit on cylindrical magnetic domains has all the advantages of magnetic recording and unlike electromagnetic storage units has high reliability and lower frequency of error (down to 10^{-11}). Its other advantages are lower sorting time,

lower power intake, smaller dimensions, and functional flexibility (possibility of accomplishing the functions of memory, logic, and switching in a single crystal).

At the present time a memory module on cylindrical magnetic domains has an information capacity comparable to the capacity of a single flexible disk [7]. The data transmission speed is lower for the magnetic domain device and at the present time its specific cost is much higher than for flexible disks. Moreover, a large majority of computer applications require the establishment of archive arrays (operations systems, libraries of programs, and various types of data files) on replaceable media for storage and transfer of information from one system to another.

This condition can be met only when a mechanically strong and inexpensive medium is used as the carrier. But at the present time it is not economically expedient to make a replaceable memory module with cylindrical magnetic domain devices.

Application. Although the original area of application of flexible disks was preparation and input of data to computing systems, the characteristics we have reviewed make it possible to assert that the FDMS is the ideal multipurpose peripheral device. Its multifunctional character makes it possible to replace such devices as punched cards and card and tape readers and storage on cassette magnetic tapes and rigid cassette disks in many applications. According to numerous statements by specialists, by 1980 punched cards and tape will be entirely supplanted by flexible disks and cassette magnetic tape will be used only in those cases when sequential access to information is entirely acceptable and low equipment cost with less rigorous reliability requirements is needed.

On the basis of analysis of the application of flexible disks abroad we may identify the following areas, without going into detail in each.

Systems for autonomous preparation and input of data and programs. Flexible disks are used as the medium in keyboard data preparation devices and provide direct or remote input/output.

Multifunctional terminals with data processing equipment. Flexible disks are used to store data and programs or as a buffer for printers, plotters, and displays.

Data processing systems based on minicomputers and microcomputers. Flexible disks are used to expand memory and provide practically unlimited, economical autonomous memory both for programs and for data, in addition to serving as a means of mutual exchange.

Flexible disks are finding broad application as external memory for the operations systems of complexes to design microprocessor systems. The use of flexible disks to debug microprograms reduces editing and

assembly time 10-20 times compared to cassette magnetic tape debugging systems that are now widespread. According to the findings of the Microkit Company (United States), the use of a flexible disk operations system makes it possible to assemble a 4,000-line program in 2.5 minutes instead of the 42 minutes required when working with storage on magnetic cassette tape or seven hours using teletype [8].

In summarizing our review of the use of flexible disks, the following can be stressed. The ease of making corrections in information stored, the compactness of a flexible disk cassette which makes for convenient storage and transportation (going as far as sending by mail), and satisfactory target indexes make flexible disks a very efficient medium for data storage and input/output.

Conclusion

FMDS's may become the principal peripheral device in systems based on minicomputers and microcomputers. They provide convenient loading and reproduction of programs and data, replacing high-speed punches and card and tape readers.

With random access to information flexible magnetic disk stores can be used efficiently as the central storage and retrieval unit, which makes it possible to eliminate storage on rigid cassette disks from the system.

As a means of input/output for both small and large computers, flexible disks can provide a linkage between them thanks to a common format and carrier. In this case standard magnetic tape, which serves to link large and small computers, may be eliminated from small systems.

Finally, flexible disks can provide inexpensive archive memory, competing with magnetic tape.

FOOTNOTES

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STUDY OF EFFICIENT USE OF CENTRAL PROCESSORS IN COMPUTER COMPLEXES

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, 1979 manuscript received 12 Dec 78 pp 78-79

[Article by N. V. Kul'kov: "Measurement of the Work Efficiency of the Central Processor Depending on Main Memory Resources"]

[Text] The most pressing problem of raising the efficiency of use of existing computers and projected computing complexes is increasing the use coefficient of the central processes. Let us note the basic causes of the decrease in efficiency of central processors.

1. Inadequate volume of main and external memory;

2. Expenditures of central processing time to feed programs (service interrupts from input devices, recode, shape arrays, and the like);

3. Use of central processors to output results;

4. Organization of roll-ins.

A study of the time losses of central processors within computing complexes [1] makes it possible not only to evaluate their real productivity correctly but also to realize economically sound methods of raising the efficiency of the computing complexes as a whole. The best known ways are optimizing the number of exchanges between memory levels [2] and including in the complex computing means oriented to high-efficiency functional processing of information flows [3]. In this respect, the adoption of one method or the other is especially important for collective-use computing centers, which usually have a high load and the most polished computing procedures.

This article presents a quantitative evaluation of the use efficiency of BESM-6 computers used as central processors depending on the volume of main memory. Results are based on analysis of the operation of the multimachine complex at the Computing Center of the Siberian Department of the Academy of Sciences USSR.

The structure of the computing complex, whose nucleus is BESM-6 machines working with a shared disk memory field, and organization of the input/output system [4, 5] provide highly efficient solutions to more than 1,100 problems a day in the batch and remote processing modes. During the study period (June 1977-May 1978) all three BESM-6's had the same external memory resources on magnetic drums and tapes, common disk memory, and equiprobable possibility of using central processors to load programs and data and to output results. However, the main memory capacity of machines Nos 1 and 3 is 64,000 words, while the capacity of computer No 2 is 128,000 words.

The chief characteristic of the efficiency of use of central processors is the use coefficient K_{cp}, which characterizes the degree of central processor loading to solve problems and principal losses during the work of the operations system. It is of practical interest to determine the relationship between K_{cp} and the volume of main memory in solving a stream of problems which, at the Computing Center of the Siberian Department of the Academy of Sciences USSR, is characterized by a broad range of scientific, scientific-technical, and economic problems and engineering calculations. The table shows values of K_{cp}

Месяц, год (Month, Year)	БЭСМ-6 № 1 (64K)	БЭСМ-6 № 2 (128K)	БЭСМ-6 № 3 (64K)
1977			
июнь Jun	0,71	0,92	0,77
июль Jul	0,87	0,94	0,86
август Aug	0,86	0,90	0,84
сентябрь Sep	0,86	0,92	0,85
октябрь Oct	0,80	0,92	0,82
ноябрь Nov	—	0,94	0,80
декабрь Dec	—	0,94	0,84
1978			
январь Jan	—	0,92	0,82
февраль Feb	—	0,92	0,84
март Mar	0,80	0,87	0,73
апрель Apr	0,84	0,86	0,77
май May	0,84	0,90	0,90
В среднем за год (Average)	0,82	0,91	0,81

Table. Values of K_{cp} for the Study Period.

for the period of study. This coefficient is computed by a formula which takes account of the chief causes of nonproductive losses of central processor time:

$$K_{cp} = 1 - \frac{T_w + T_{i/o} + T_b}{T_{os}},$$

where T_{os} is the lifetime of the operations system; T_w is test waiting time (downtime of central processor because of lack of assignments in

main memory); $T_{i/o}$ is central processor time used for data input/output; T_b is central processor time used to organize boosts.*

As can be seen from the average values of K_{cp}, during the period of study K_{cp} for computer No 2, which has a memory capacity of 128,000 words, was 9-10 percent higher than for Nos 1 and 3 with memory capacities of 64,000 words.

Thus, analysis of the values of K_{cp} shows that increasing the memory capacity of the BESM-6 by 64,000 words makes it possible to raise K_{cp} by 10 percent. When the computer works 21 hours a day (the average useful working time of 1 BESM-6 in a year) this provides an additional two hours of usable time for calculating problems.

FOOTNOTES

1. Maksimenkov, A. V., and Rykov, L. G., "Evaluation of the Productivity of a Multiprocessor Collective-Use Computing System" AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA 1976, No 6, pp 72-80.

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[422-11176]

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* T_b was determined by the number of boosts, figuring that the time necessary for one boost in the BESM-6's DIAPAK operations system is five milliseconds.

USSR

KVARTS-1 HOLOGRAPHIC MEMORY UNIT

Moscow PRAVDA in Russian 4 Sep 79 p 2

[Text] At the Belorussian Academy of Sciences Institute of Electronics work is being conducted on the creation of holographic memory units which increase both computer operating speed and the volume of processed information.

In the photograph, V. Yarmolitskiy, A. Guk, and A. Yesman, co-workers at the laboratory for optical methods of information processing, conduct experiments.
[429]

CSO: 1863-P

USSR UDC 681.2.004.15

INCREASING THE EFFICIENCY OF INFORMATION CONNECTIONS IN HARDWARE COMPLEXES FOR LOCAL INFORMATION AND CONTROL SYSTEMS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 7, 1979 pp 8-9

RADIONOV, M. P., DUBINCHUK, V. L., SUL'MAN, L. A. and BURGUTIN, YU. I., engineers, and BAZUTKIN, V. V., candidate in technical sciences

[Abstract] The hardware complex of the information and control system of blast furnace No 9 at the Krivorozhstal' Plant makes extensive use of units for local information and control systems: KM2101 centralized program and logical control sets; frequency signal emitters; digital indication blocks; automatice devices with secondary high-frequency compensation; generator transformers, and so on. Remote measure is accomplished by frequency signals: a zero magnitude corresponds to 4 khz and the maximum magnitude is 8 khz. The remote measurement technique has several advantages, including simplicity, low cost, easy expansion, and ability to work over long distances. The chief problem that has occurred is pulsed interference, chiefly caused by transmission processes in the electrical circuits. This noise is superposed on the transmitted signals and must be eliminated for efficient communication. The best way to overcome the problem is to raise the signal-to-noise ratio by increasing the output voltage to 6-12 v. This greatly reduces the mean quadratic deviation of the frequency from its true value. A second method is to install a compensation filter to reduce high-frequency signals. It is also possible to use a "mathematical filter," that is, an algorithm that corrects measurements. Figures 2; tables 1; references 7 (Russian).
[431-11176]

11176
CSO: 1863

UDC 621.372

AN ANALOG MULTIPLIER BASED ON MICROELECTRONIC SQUARE-LAW GENERATORS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 8, 1979 pp 58-61

[Abstract by A. Ya. Sal'nichenko, Taganrog Radiotechnical Institute imeni V. D. Kalmykov]

[Text] The author discusses a multiplier with squaring elements that are based on resistance heaters and and transistorized heat receivers. He presents the basic relationships between the electrical and thermal characteristics of microelectronic square-law generators and the schematic diagram, structural elements and parameters of the multiplier.

[105-11746]

11746
CSO: 1863

MINISTRY OF ELECTRONICS INDUSTRY DEVELOPS LARGE-SCALE MICROCIRCUITS

Moscow PRAVDA in Russian 31 Oct 79 p 2

[Article]

[Text] Enterprises belonging to the Ministry of the Electronics Industry are developing and manufacturing large-scale integrated microcircuits that contain up to hundreds of thousands of elements on a silicon crystal measuring 6 x 6 mm. The creation of microcircuits with such a large number of elements is impossible without the use of an automated design system.

A vacuum deposition unit, which is used for the controllable application of metal films with the help of an electron beam, is widely used in the production of large- and superlarge-scale integrated circuits.
[80-11746]

11746
CSO: 1863

E. Programming and Software

USSR UDC 631.3.06

'POLYP' PROGRAMMING SYSTEM

Moscow PROGRAMMIROVANIYE in Russian No 1, Jan/Feb 79 pp 43-54 manuscript received 1 Dec 76

MUSSTOPF, G., Federal Republic of Germany

[Abstract] POLYP [Problem Oriented Language for System Software Programming) consists of a programming language and a macrolanguage. The former is structurally similar to but semantically very different from ALGOL-60. Here data are described by the type (integer, integer without sign, real, logical, character, address, or target), the form (variable, array, or table), length, position, and other attributes such as those affecting the memory allocation or controlling the register utilization. The operators, on the other hand, correspond more closely to those of the higher-level ALGOL-60 languages, though data of the address type also affect the semantics. While no input-output function has been developed specially for POLYP, there are means available for interlinkage such as through COCOBEG (compiler control begin) and COCOEND (compiler control end). POLYP macrolanguage is determined specially for a given programming language, rather than independently of the processed texts and thus universally. Therefore its syntax must essentially correspond to that of the programming language and the representation of words in it must be identical to that in the programming language, without extra symbols. POLYP hardware includes a compiler consisting of a macroprocessor, a central compiler and a generator of object codes. There are also provided means for testing, namely universal and special debugging, with attempts being made to unify them into a PROMOTE (Process Oriented Module and Total Test System). The multilevel POLYP system has been proved out in many designs of system-wide and special-purpose software. Little further modernization is contemplated, except in the ways and means of program debugging. Figures 4; references 18 (Western).
[401-2415]

2415
CSO: 1863

UDC 681.3.06.001.63.681.513.2

AUTOMATION OF PROCESSES OF SOFTWARE DESIGN

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, 1979 pp 44-48 manuscript received 13 Dec 78

[Article by B. S. Volovenko and M. S. Kupriyanov: "Structure of Software and Automating Its Design in Programmed Control Systems"]

[Text] The widespread production of microprocessors and microprocessor sets has changed the principles of organization of the hardware of programmed control systems, necessitating higher requirements for them and an expansion of the list of functions performed. The introduction of general-purpose computing equipment creates a need for development, first of all, of elaborate software for efficient operation of programmed control (PC) systems. In this case only the introduction of industrial methods of developing, debugging, and documenting software elements will avoid system obsolescence and make it expedient to disseminate the system.

For this reason, the questions of determining the composition of the software of PC systems, the principles of organizing various elements of software, and devising means for automated design of software are very timely. It should be observed that the questions with respect to automated control systems for objects in real time were considered in [1]. We consider below the characteristics of constructing elements of software and means of automating their design which arise from a new element base and from the fact that the systems under consideration are designed for direct control.

<u>The structure of software for PC systems</u>. Analysis shows that a PC system includes two control consoles (primary and auxiliary), one or several microprocessors, a hierarchical memory, peripheral devices (most often photo reading devices and punches), various functional blocks that provide hardware support for the software, and a block for communication with the object of control; these elements are joined by one or several main lines. When industrial equipment is controlled in a PC system the following functions are realized:

1. Loading with preliminary packaging of the program for machining the part;

2. Editing the program for machining parts;

3. Storage of the program for machining parts;

4. Preparation of the necessary data to feed to the industrial equipment;

5. Delivery of definite batches of information to industrial equipment as processing progresses;

6. Analysis of the condition of industrial equipment and formation of corresponding characteristics;

7. Monitoring and recording the condition of control console elements (operator, adjuster, programmer-production engineer);

8. Control of the logic of the machine tool;

9. Recording errors in kinematics of the machine tool and tool wear;

10. Communication with the higher-ranking computer (if necessary).

The software of a contemporary PC system that realizes these functions should meet the following requirements:

1. Insure the problem orientation of system hardware;

2. Satisfy the principles of compatibility and succession in the family of PC systems based on microprocessors;

3. Insure enhanced system reliability;

4. The structure of the software should satisfy the modular principle, which simplifies modernization of the system.

These lists of functions and requirements may be specified more precisely depending on the purpose of the system, but they define the model variation of the structural diagram of software [2].

Service subroutines include the loader, editor, and librarian. The loader feeds a frame of the program (or the entire program) into buffer (or general main) memory, at the same time compressing the program. The editor edits the program that has been fed, erasing, substituting, and inserting individual words and frames. The given subroutine should provide editing when the entire program is in storage and when one frame is. In the latter case the editing array (array of changes and insertions) is recorded in a separate memory block and when the control program is run it is corrected by the contents of

this block. The library plugs in standard subroutines during system functioning.

Subroutines for organization of the computing process, which are included in the operations system, should insure effective functioning of PC systems of various configuration in a given work mode. These subroutines should insure system functioning in both the single-program and multiprogram (when controlling complicated industrial complexes equipped, for example, with robots) modes. The initial launching subroutine is designed to switch the system from its initial state to the work mode assigned by the operator at the console. It clears the necessary registers of the microprocessor, feeds a constant, begins monitoring the blocks of the system, and transfers control to the controller ("dispetcher"). The controller determines the strategy of system operation, monitoring the work of the interrupt device, and then transfers control to the supervisor ("supervizor"), which determines the order of performance of subroutines depending on the mode of operation established by the controller. The supervisor organizes dialogue with the human operator through the console; it also includes the subroutine that outputs information to external devices. The timer monitors the time counter, organizing the performance of industrial commands, determines the periodicity of engaging the subroutine, and so on.

Subroutines for monitoring and maintaining reliability include the monitoring problem subroutine which provides a check on interaction between the system and equipment; diagnostic tests that check the blocks of the system and identify malfunctions; the reconfiguration subroutines which plug in standby blocks of the system and essential programs when malfunctions occur, keep track of the most frequent malfunctions, and indicate changes in the configuration of the system, updating of the program, and so on.

Means of programming and debugging include the cross-assembler, the problem-oriented language, and the debugging and modeling subroutines. The cross-assembler is used to formulate software elements. It is preferable to other programming means because it permits the formulation of effective programs and a translator from it does not occupy storage right in the system. The problem-oriented language (and translator from it) is necessary to write programs for control of industrial equipment and makes it possible to organize effective feeding of programs directly from the control console, bypassing the process of preparing punched tape. It is also expedient to organize the debugging and modeling subroutines on a general-purpose machine, because this makes it possible to use all the dialogue means represented in this machine. These subroutines are designed for debugging software and modeling the system in order to obtain the statistical data necessary for planning and also to check correct functioning.

The applied programs are sets of distinct programs that perform standard computations (conversion from one system of coordinates to another, interpolation, calculation of equal distance, and the like) or the functions of data collection and processing. They determine the problem orientation of the software and may be written by the users themselves.

To simplify the elements of internal software it is advisable to make the distribution of buffer memory (memory containing one frame of a program and the information necessary for processing it) fixed in zones, oriented to the largest frame of the program.

Figure 1 below shows a generalized diagram of the distribution of buffer memory. A frame of the control program in packaged form is arranged in

Figure 1. Diagram of the Distribution of Buffer Memory

Key: (1) Frame of the Control Program in Packaged Form;
(2) Characteristics Formed During Program Feeding and Data Preparation;
(3) Characteristics Formed by the System During the Control Process;
(4) States of Control Console Elements;
(5) Information for Output;
(6) Zone for Storage of the Trajectory of Tool Movement;
(7) Zone of Working Cells;
(8) Zone of State of Interrupted Programs;
(9) Zone of Service Information;
(10) System Zone.

the first zone. A line (or group of lines) of the frame of the program is strictly assigned to each cell of this zone. Compression is accomplished by eliminating the symbols of lines of the frame, whose functions in the given case are performed by the addresses of the cells of the zone.

The characteristics that arise during the feeding and preparation of data and are necessary to organize the computing process as well as the characteristics that arise in the system during the control process (positions of various elements, presence of feedback, and so on) and are necessary for operational communications between the PC system and industrial equipment are formed in the second and third zones.

An "image" of the control console is formed in the fourth zone. The supervisor works with it between the moment when it queries the state of the control console elements. The frequency of supervisor inquiries to the console is determined by the timer and is chosen so that the response of the PC system will occur without a delay noticeable to the human eye. A decrease in the frequency of supervisor references to the control console decreases the load on the microprocessor and improves noise suppression in the information channel where the control console is far away from the primary component.

The fifth zone contains information for output to the control console indicators, and the sixth zone has information on the trajectory covered by the tool (the length of the segment stored may vary) and the trajectory necessary to return the tool.

The zone of working cells (seventh zone) stores intermediate results, base addresses, and the like. The zone of service information (eighth zone) stores the words for the states of programs being interrupted.

The ninth zone stores constants, cycle counters, threshhold values of parameters being monitored, and the like.

The 10th zone contains information on the number of microprocessors and other blocks in operation, malfunctions arising in the system, and priorities.

Development of the complex of program means is quite a labor-intensive job and it is not possible without means of automating program design. We consider below a set of subsystems that form a unified automated system for designing software elements of PC systems.

<u>Automated system for development of software elements</u>. This system encompasses the primary stages in development of software and includes the following subsystems:

1. Subsystem for automated development of charts of algorithms;
2. General-purpose cross-assembler;
3. Subsystem for automated development of microprograms;
4. Modeling subsystem.

The system is constructed on the modular principle and consists of a number of programs working under the control of a disc operations system of a modular system of computer technology. The structure of the software of the automated system is shown in Figure 2 below.

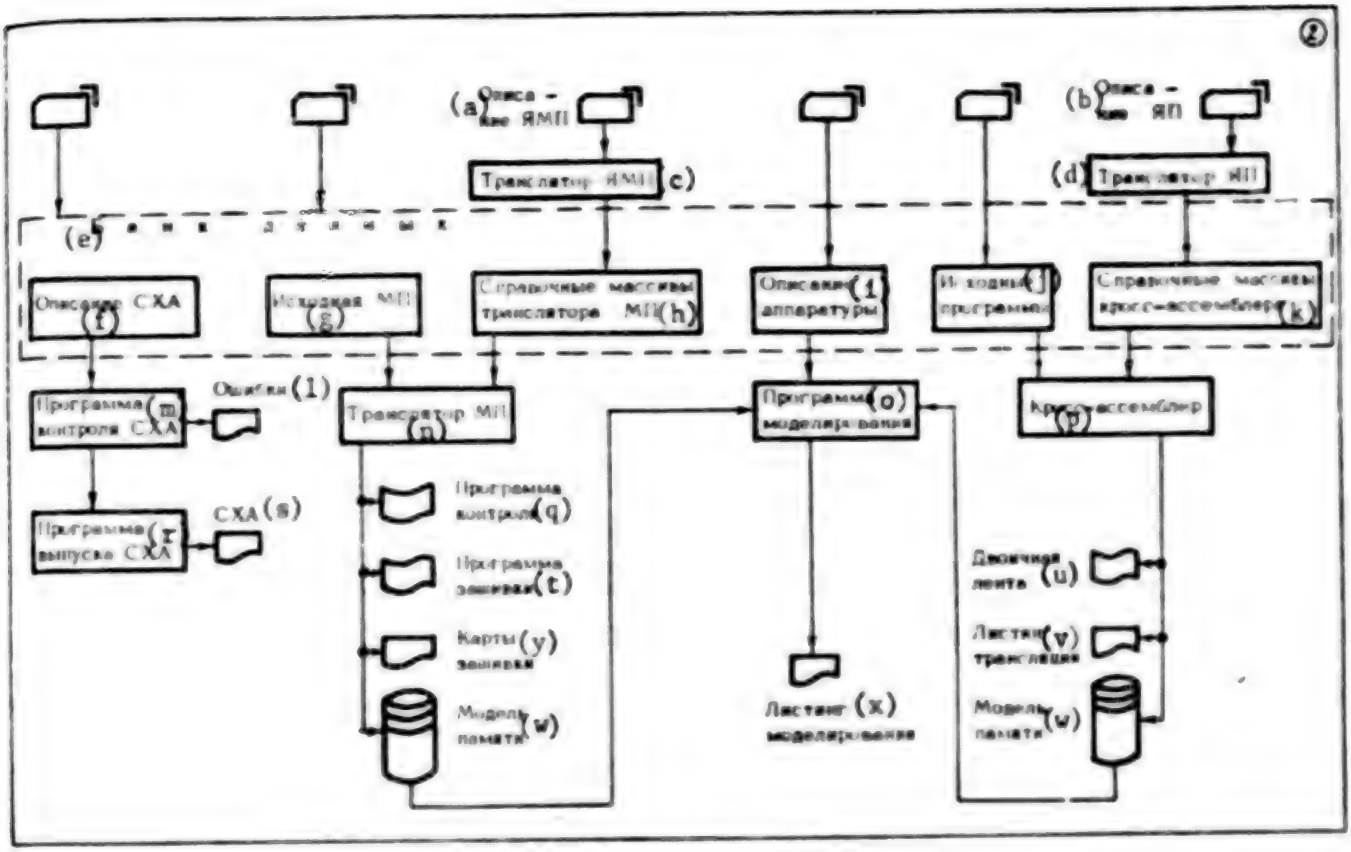

Figure 2. Structure of the Automated Sysgem

Key: (a) Description of Microprocessor Language;
(b) Description of Programming Language;
(c) Microprocessor Language Translator;
(d) Programming Language Translator;
(e) Data Bank;
(f) Description of Algorithm Chart;
(g) Initial Microprocessing;
(h) Reference Arrays of Microprocessor Translator;
(i) Description of Apparatus;
(j) Initial Programs;
(k) Reference Arrays of Cross-Assembler;
(l) Errors;
(m) Monitoring Program of Algorithm Chart;
(n) Microprocessor Translator;
(o) Translator;
(p) Cross-Assembler;
(q) Monitoring Program;
(r) Algorithm Chart Output Program;
(s) Algorithm Chart;
(t) Sewing Program;
(u) Double Tape;
(v) Translation Listing;
(w) Model of Memory;
(x) Modeling Listing;
(y) Sewing Cards.

The subsystem for automated development of algorithm charts (AC's) performs the functions of feeding, monitoring, storing, correcting, and documenting algorithm charts. The initial document of the subsystem is the AC, which is made by the developer on a blank broken into zones, each containing a single geometric symbol. The basic symbols of GOST [State All-Union Standard] 19428-74 are taken as the geometric symbols. The geometric symbol contains the internal information (text) and external information (tag and codes of conditions). In addition, each geometric symbol has its own address, which indicates the number of the AC sheet and position on the sheet.

There are systems of automated AC development that require them to be described in a special problem-oriented language [3]. The use of a special language to describe AC's results in an intermediate document (initial AC description) and requires a translator from this language, which complicates the actual process of automated development. In addition AC descriptions in a special language are not as graphic as the algorithm chart itself.

In the subsystem being described here the AC made by the developer is the only document from which the punched card file is prepared. Information on one geometric symbol was transferred to the punched card in the following order: address of the geometric symbol, type, address of the transfers, text. One punched card is required for each geometric symbol. The order of arrangement of punched cards when they are fed to the computer does not matter.

Information being fed to the system is recorded in the data bank where it may be subjected to syntactical monitoring and correction. During documentation of AC's connections are traced among related geometric symbols and results are printed on the alphanumeric printer. The format of the AC sheet may change at the user's order. It takes about one minute to produce one AC sheet.

At the present time the subsystem is being modernized for the following purposes:

1. To insure the possibility of monitoring the correctness of the AC from the viewpoint of structural programming;

2. To insure the possibility of input/output by means of a screen console.

The universal cross-assembler translates software subroutines into binary code and may be switched from one programming language to another within a fairly broad range. The universality of the cross-assembler is achieved by the use of replaceable reference tables that define the syntax and semantics of the input language. Statements are written in free format and they have one of two forms.

The first form of statement may consist of name fields, the op code, operands, and commentary. The name fields, operands, and commentary may be absent. The name field is used to record the symbolic name which the programmer wants to assign to the given statement. The symbolic name may consist of eight or fewer symbols and must begin with a letter. The symbol for a colon (:) must follow the name; it is understood by the translator as the sign that there is a name field.

The field of the op code must be filled, and each permissible op code contains no more than four symbols. Moreover, gaps between these symbols are not permitted. The operand field follows the op code field after one or several blanks and they contain up to two operands separated from one another by a comma. Gaps are not permitted in the operand field.

Each operand is characterized by permissible representation procedures depending on the op code. The following operands are distinguished by method of representation: standard tags; dioctal constants; octal constants; decimal constants; binary constants; symbolic names. The standard tags are the tags given to numerical quantities. These tags

Tag	Quantity	Tag	Quantity
B	0	H	4
C	1	L	5
D	2	M	6
E	3	A	7

correspond to the standard tags used in the assembler of the Intel-8080 microprocessor [4].

The commentary field follows one or several blanks after the operand field and contains explanations that should be printed in the listing. The statement ends with a semicolon (;). Several statements may be placed on one card. The position of the final column should be assigned; where nothing is said it is column 71. The statement may begin on one punched card and end on another.

The distinguishing feature of the second form of statement is that it does not have a strict separation between the op code and operand. This method of writing is more graphic and closer to algebraic writing. For example, the statement for addition of operands A and B may be written A + B.

The process of setting the cross-assembler for the particular language is accomplished by automatic generation of replaceable reference tables for the given language description. The language description is made in the form of tables. The principal tables are tables of operations. the table of operands, and the table of formats. In the generation process these tables are converted into a series of internal reference arrays: op codes, statement lengths, types of operands, procedures

for representing operands, format numbers, descriptions of formats, and number of operands.

The cross-assembler was tested in practice during construction of the translator for the Intel-8080 microprocessor and the Elektronika-NTs microcomputer.

The subsystem for automated development of microprograms provides input, monitoring, storage, and translation of microprograms with output of permanent memory wiring cards, flow charts of microprograms, and flow charts of controlling programs for automatic devices that wire and monitor permanent memory.

Either a flow chart of the microprogram or the text of the microprogram in Mnemokod constitutes the raw data for the subsystem. The initial statement in Mnemokod may consist of three fields: name field, body field, and commentary field. The name field may contain either a symbolic name or the actual address written in the form of a constant. The body field is a series of operands separated from one another by dividers. The operand may be either a permanent combination of symbols (a key) or an addressable quantity. The key is the sign of a definite microoperation or a service code. The addressable quantity consists of the sign of the address (one symbol) and the quantity itself, which may be represented either by a symbolic name or a constant. The sign of the address is separated from the quantity itself by a period.

Constants may be binary, octal, decimal, and dioctal. The constant always ends with a sign that indicates the type of constant. The sign of the binary constant is the letter B. The sign of the octal constant is the letter Q. The sign of the decimal constant is the letter D and for the dioctal content it is the letter H. The sign of the address serves as an indicater of the microcommand field in which the binary equivalent of the quantity should be placed.

The microprogram translator is constructed on the basis of replaceable reference tables and can easily be switched from one Mnemokod to another. The replaceable reference tables are generated by a special translator of microprogramming language descriptions. The use of replaceable reference tables allows changes in the following Mnemokod characteristics: formats of microcommand; keys and binary equivalents corresponding to them; signs of addresses; the divider symbol.

The subsystems considered above have been realized on an M4030 machine using Fortran. Each subsystem requires at least 110,000 bytes of memory, which together with the disc operations system does not exceed the dimensions of main memory.

<u>Conclusion</u>. The appearance of microprocessors made it possible to improve the quality of the control process by setting up flexible and reliable programmed control systems with sophisticated functional possibilities. Expansion of the functions realized by a PC system

leads to an increase in the number of software elements and a rise in the cost for their development. Efficient introduction of processors in PC systems demands comprehensive solutions to the problems of the development of software structure and modules for its hardware support, as well as means of automated program design.

FOOTNOTES

1. Lipayev, V. V. Kolin, K. K., and Serebrovskiy, L. A., "Matematicheskoye Obespecheniye Upravlyayushchikh TsVM" [Software for Controlling Computers], Moscow, Sovetskoe Radio, 1972, 628 pp.

2. Krinitskiy, N. A., "Analysis of Computer Software" PROGRAMMIROVANIYE 1978, No 4, pp 3-15.

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[422-11176]

11176
CSO: 1863

UDC 681.3.43

ORGANIZATION BY LEVELS OF NEW MINICOMPUTER OPERATIONS SYSTEM

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, 1979 manuscript received 18 Oct 78 pp 55-57

[Article by Yu. A. Basin: "Architecture of the OS-NTs-1 System"]

[Text] Introduction

The methods of structural planning [1, 2] and technological programming means [3] impose certain requirements for the architecture of operations systems:

1. Insuring homogeneous, structured memory and standardization of access to data on this basis;

2. Insuring automatic initiation of processes from external sources;

3. The possibility of describing processes and entire systems at the functional level without regard for programming technique.

All of these requirements were reflected in development of the OS-NTs-1 operations system for the Elektronika NTs-1 minicomputer [4].

This article describes the architecture of the OS-NTs-1 system and requirements imposed by the system on the structure of user programs. The description is given according to the scheme proposed by Dijkstra [5].

Architecture of the System

The structure of the OS-NTs-1 system can be represented in the form of several built-in virtual machines or levels, each of which is a constituent part of the other [5, 6]. In this case the means available on inner levels are accessible to processors on outer levels.

Let us consider the structure of the OS-NTs-1 system represented in the figure.

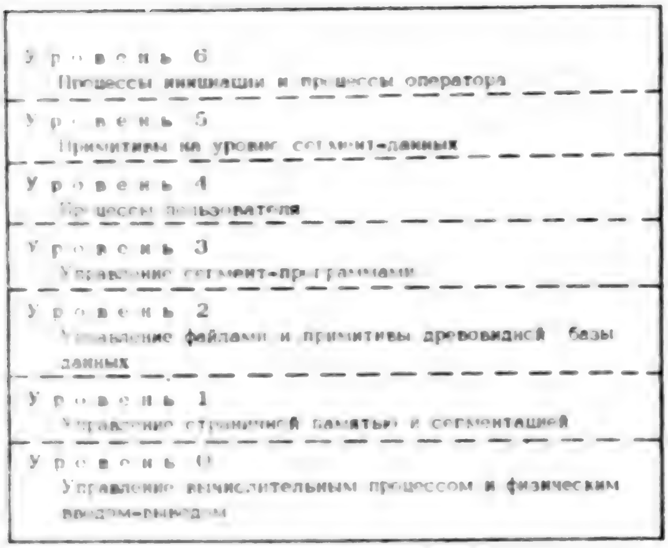

Figure. The OS-NTs-1 System

Key:
(6) Level 6. Initiation Processes and Operator Processes;
(5) Level 5. Primitives at the Data Segment Level;
(4) Level 4. User Processes;
(3) Level 3. Control of Program Segments;
(2) Level 2. Control of Files and Primitives of Data Base Tree;
(1) Level 1. Control of Page Memory and Segmentation;
(0) Level 0. Control of Computing Process and Physical Input/Output.

At level 0 of the system the computing process is controlled, that is, supervisor operations are performed, including planning the work and processor time. Multiprogram service in real time is provided here. The other part of this level is control of physical input/output. As a result, the interface for connecting the input/output unit and its specific features becomes insignificant for higher-level processes, in other words, the processes work with logical devices.

Level 0 also performs supervisor functions in relation to the operations system itself. The rules of constructing higher levels are defined in such a way that subsystems at each of the levels are independent, that is, accomplished on their own virtual processor [6]. Each lower level represents a set of primitives which can be used as extracodes by higher levels. In this case the subsystems at higher levels act as problems in relation to lower levels of the system.

This same level realizes the possibility of parametric adjustment of the operations system for a concrete configuration of system equipment and for user demands.

Algorithms for control of page memory and segmentation are fed at level 1 of the system. In this way, the memory becomes virtual, forming segmented space. The segment is the basic unit of data representation for processes performed at levels higher than the first. Access to the segments is accomplished by a set of keys that identify both the segment itself and its place in the system of files.

The primitives at this level insure page distribution and recording in main memory, formulation of parts of memory as segments, and exchange of segments between main and external storage. The exchange includes analysis of the segmented space, removing relatively inactive segments from main memory, and loading needed segments into the open places.

The system is designed to insure homogeneity of storage not only for objects "known" to the process and defined by it in virtual memory, but also for files and data bases [7, 8]. Work with files comes down to work with segments [6] and the files are viewed as part of the segmented space (virtual memory) of the process. On the other hand, this level insures homogeneity only in information control and does not take into consideration the organization of user files, data bases, and control of external memory.

The primitives of level 2 of the system are given the functions of organizing (structuring) the data joined in the files and the functions of controlling external memory. For levels of the system higher than the second the data are a structured set (in the form of a tree) in virtual memory. The tree structure was chosen as the basic structure because it reflects the hierarchical subordination of the data. However, the types of structures can quite easily be supplemented by introducing primitives at this level for processing corresponding data structures. The number of tiers of the tree of a file is a parameter, which makes it possible to construct tree structures with a given number of tiers on a selected path of the tree.

The primitives for control of page memory and segmentation which were found on level 1 are supplemented by the primitives for control of external memory at level 2. This results in complete homogeneity of memory for processes at higher levels of the system.

Control of program segments is exercised at level 3. Two types of program segments are considered: subroutines and subtasks reflecting hierarchical and parallel performance of processes respectively. Communication between program segments is established at the moment that they are launched [7, 8].

At level 4 user programs are performed; the resources of the preceding levels are given to them. The user processes themselves operate as the inner level of the subsystem for control of data segments. This subsystem is accomplished at level 5 and separated from control of program segments.

The distribution of primitives of control over programs and data on different levels results from the fact that the entry of the file that defines a program segment is represented by a single block. Therefore, there is a one-to-one correspondence between program entries and program segments. Data entries are distributed to blocks corresponding to the physical constraints of the modules loaded in main memory; the data entry and data segments reflect different objects because in this case the segment reflects only one block of the data record. A separate level of the system is introduced to establish a one-to-one correspondence between data entries and data segments.

Access to file data by block is organized on level 5. The user here has the impression of working with a single segment of data. To minimize and simplify relationships between user processes and the operations system, the data access functions are assigned completely to the system. The user is given the base of the needed data segment. The diversity of data control algorithms in user processes results in the organization of a standard set of primitives for access to data.

Thus, the introduction of level 5 in the system makes it possible to simplify user programs by eliminating the functions of access to data. On the other hand, it becomes possible to separate the user process into components: informational and processing. The informational component of the process performs the functions of access to data and is accomplished by the system. The processing component of the process is accomplished by the user's own algorithm.

Level 6 is designed to initiate processes in the system, in particular to organize operator dialogue with the system. A process in the system can arise only as the result of some external factor. In part these factors may be standardized in the system; in part they are factors specific to the particular user system. An apparatus for description of processes has been included in the system to take account of the diversity of external factors and makes it possible to establish a correspondence between external factors and processes. On the one hand, this insures automatic initiation of a process, while on the other hand it becomes possible to give a functional description of user systems at the process level. The keys of processes and data bases are included in the description as parameters.

Structure of User Programs

The architecture of the OS-NTs-1 system imposes definite structural requirements on organization of user systems, which refers to the aggregate of all interrelated user processes. The relationship between distinct processes in the system is a functional, temporal, and logical (through data) one. In relation to one another processes may be subordinate and co-subordinate [2]. This makes it possible to carry out hierarchical decomposition of the user system into particular levels. Processes are independent within each level.

Hierarchical decomposition of a system into distinct processes is fundamental to insure the simplicity and reliability of software [1, 2, 3].

In the OS-NTs-1 system it is preferable to tie the decomposition of a user system to a standard set of primitives for data control (level 5). Then two functional parts are singled out in each user process: data control and data processing. The first part is realized by the operations system and the second by the user. In this way the user concentrates chiefly on solving his own problems and is only minimally distracted to solve problems of relations with the operations system.

To compose a system from distinct processes the user is given an opportunity to describe each process and the interrelations of processes in the system. In other words, the user can describe the system at the functional level without going into details of the concrete realization of particular processes. The descriptions are fed and eliminated by program, which makes it possible to trace dynamically changing conditions of the functioning of the user system. The descriptions may be joined into a separate description program or be included as constituent parts of data processing programs.

The factor of process initiation, the user file and program for processing it, and also the systems algorithm for access to data from the file are indicated during description of the process.

Conclusion

The homogeneity of memory, including memory files, makes it possible to standardize algorithms for data retrieval. As a result, the volume of programming in the assembler language is reduced about 20-30 percent.

Introducing an apparatus for functional description of processes in the system makes it possible to reduce development time for system users by about half and significantly cut software debugging time.

At the present time, level 0 of the OS-NTs-1 system has been debugged and is functioning on the Elektronika NTs-1 minicomputer. The other levels of the system are in the stages of design and debugging.

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[422-11176]

11176
CSO: 1863

UDC 681.327

OPTIMAL ARRANGEMENT OF DATA FILES

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 6, 1979 pp 56-59 manuscript received 5 Dec 78

[Article by V. T. Dantsev and V. N. Ognev, Leningrad]

[Excerpt] The problem is discussed of the optimal arrangement of data files on magnetic tape. The problem is formulated as an extremum problem of the combinatorial type, for the solution of which is employed a modification of the method of branches and bounds.
[42-8831]

8831
CSO: 1863

UDC 681.325.5

ALGORITHMS FOR COMPUTING ELEMENTARY FUNCTIONS BY THE 'DIGIT-BY-DIGIT' METHOD WITH DIRECT VERIFICATION OF CONVERGENCE

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 6, 1979 pp 53-55 manuscript received 16 May 78

[Article by V. D. Baykov and A. A. Makhanov, Leningrad Electrotechnical Institute imeni V. I. Ul'yanov (Lenin)]

[Excerpts] The microprogram implementation of elementary functions is employed at the present time in a number of control machines and electronic keyboard computers. The trend has also been planned for the microprogram implementation of elementary functions in high-efficiency general-purpose digital computers. With microprogram implementation, for a single method

of computation can be obtained a number of computing algorithms characterized by different parameters, such as speed of response, structure of the equipment and accuracy. This makes it possible to broaden considerably the range of application of the computation method and to obtain modifications of algorithms surpassing the basic algorithm in a number of characteristics.

In this article are discussed modifications of algorithms for the computation of elementary functions by the "digit-by-digit" method [1,2,3] for a number system with an arbitrary base, q.

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[42-8831]

8831
CSO: 1863

UDC 681.3

METHODS FOR RAPID GEOMETRIC TRANSFORMATIONS OF IMAGES ON A COMPUTER

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 8, 1979 pp 42-46 manuscript received 11 Dec 78

[Abstract by V. K. Zlobin, A. A. Anurkin and Yu. N. Kirilin, Ryazan' Radiotechnical Institute]

[Text] The authors propose a series of methods for rapid geometric transformations of images on a computer. They investigate the accuracy of the processing and its operating speed in comparison with the methods normally used.

[105-11746]

11746
CSO: 1863

UDC 62-50

EVALUATING THE DETECTION CAPABILITY OF SYSTEMS FOR MONITORING INFORMATION RELIABILITY

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 8, 1979 pp 51-58 manuscript received 18 Sep 78

[Abstract by V. I. Fomin, Leningrad Institute of Precision Mechanics and Optics]

[Text] The author discusses an approach to evaluating the effect of using information monitoring methods at different stages of its processing (input, transmission, registration, storage, processing). He proposes the use of a reduction coefficient K_R for these purposes, and presents formulas for calculating K_R for different configurations of the monitoring system. The proposed approach is usable for evaluating the effectiveness of monitoring during the designing of hardware for automated management systems.
[105-11746]

11746
CSO: 1863

F. Automated Design and Engineering

UDC 681.3.05+681.2+621.31

AN APPROACH TO AUTOMATING THE DESIGNING OF INFORMATION PROCESSORS USING A PARAMETRIC BASE

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 8, 1979 pp 46-51 manuscript received 15 Mar 79

[Abstract by V. S. Moiseyev, Leningrad Institute of Precision Mechanics and Optics]

[Text] The author proposes the use of a parametric base in order to automate the functional stage of the process of designing information processors. He presents a classification of the parameters characterizing a processor and the conditions under which it functions. He also formulates the basic problems of automated designing of information processors on a parametric base.
[105-11746]

11746
CSO: 1863

PROGRESS REPORTED ON AUTOMATED DESIGN SYSTEMS IN CONSTRUCTION

Moscow NA STROYKAH ROSSII in Russian No 9, 1979 p 2

[Article: "The SAPR OS — an Effective Tool for Creating New Technology and Organization of Design Work"]

[Excerpt] The experience with automation of design work acquired by organizations of USSR Gosstroy, RSFSR Gosstroy, Gosgrazhdanstroy [possibly State Committee for Civil Construction], and several ministries and departments has demonstrated that the use of automation equipment makes it possible, by improving design methods (including optimization of design decisions and use of multivariation designing) to insure a 2-5 percent reduction, and in some cases 10-15 percent, in the cost of projects. This is accomplished chiefly by saving on use of materials. At the same time labor inputs are cut and design time is reduced 20-30 percent.

Design automation has made great progress in the area of performance of engineering-technical and estimate calculations; the level of automation of this work sometimes reaches 70-90 percent.

Experience accumulated in our country made it possible to formulate the challenge of creating automated design systems (SAPR) in the form of new organizational-technical systems oriented to automated designing of construction projects at the level of the design institute. The development of such automated design systems ultimately leads to the creation, on the basis of contemporary automation equipment, of new technology and organization of design work to increase the quality of design, reduce design time, and strengthen the material-technical base of design organizations. This made it possible in 1976 to begin devising 16 automated design systems for large institutes that design industrial, civil, transportation, energy, rural, and other projects; introduction of the first phases will begin at the end of the current five-year plan. This work will make it possible to save 2-5 percent on materials and energy and reduce design time by 10-20 percent.

Many scientific research and design organizations are taking part in the development of the automated design systems at design institutes.

USSR Gosstroy has done a great deal to formulate systems to coordinate scientific research and experimental design work; this covers more than 40 ministries and departments through the Coordinating Council of TsNIIPIAS [possibly Central Scientific Research and Experimental Design Institute of Automated Systems in construction].

[78-11,176]

11136
CSO: 1863

INSTITUTE COMPUTING CENTER SERVES MANY RELATED ORGANIZATIONS

Moscow NA STROYKAKH ROSSII in Russian No 9, 1979 p 8

[Article by A. Krippa, head of the division of design work at TsNIIEP Zhilishcha, candidate in architecture: "The Efficiency of Using Computers"]

[Excerpt] The introduction of modern high-speed electronic machines into the design process greatly increases the labor productivity of planners. In addition to speeding up the design process the use of computers makes it possible to improve the quality of design documents and raise the efficiency of use of materials, above all ferrous metals, by improving design concepts, drawings, and methods of calculating them.

At the present time more than 10 percent of design work at TsNIIEP Zhilishcha [Central Scientific Research and Planning Institute of Model and Experimental Design in Housing] is done by computers. One hundred and twenty persons are employed in the field of computer applications.

In 1971 the institute organized a group computing center to organize the essential hardware and software for broad introduction into practical planning and scientific research at central institutes of Gosgrazhdanstroy [possibly State Committee for Civil Construction].

The group computing center provides the following services by orders from subdivisions of TsNIIEP Zhilishcha and other organizations: operator calculations using programs available in the center's resources; operator services in debugging programs; purchasing and incorporating new programs at the request of customers.

The center now serves 39 subdivisions of the institute and six central institutes of Gosgrazhdanstroy. TsNIIEP Zhilishcha uses about 70 percent of usable computer time, other institutes of Gosgrazhdanstroy used 25 percent, and a few organizations of USSR Gosstroy use about five percent.

The equipping and development of the computing center of TsNIIEP Zhilishcha began in 1970 when a "Minsk-22" computer was installed. The center's quarters have now been redesigned and one M-6000 and two YeS-1022 computers have been brought on line.

[78-11,176]

11176
CSO: 1863

PACKAGE OF APPLIED PROGRAMS FOR CONSTRUCTION DESIGN WORK READY

Moscow NA STROYKAKH ROSSII in Russian No 9, 1979 p 60

[Article: "The Central Scientific Research and Design Institute of Metal Construction Elements Recommends"]

[Text] Package of Applied Programs for Construction Elements — Automated Design of Commonly Used Construction Elements.

The package of applied programs for automated design of construction elements using YeS computers contains software to design commonly used reinforced concrete elements in conformity with existing construction norms.

The first phase of the package consists of the following programs:

MARS-YeS-78 — calculation of core systems for static and dynamic loads, sorting out the worst combinations and choosing reinforcement for the columns, using the YeS disk operations system (TsNIPIASS [Central Scientific Research and Experimental Design Institute of Automated Systems in Construction]);

BALKAN — calculation and design by protypes of prestressed reinforced concrete beams using a YeS operations system (TsNIPIASS);

BALKA-YeS — designing conventional bending reinforced concrete elements using YeS disk operations system (Dnepr Promstroyproyekt [possibly Institute for Planning of Industrial Enterprises]);

APTF-YeS — designing model reinforced concrete foundations using a YeS operations system (Leningrad PI-1);

LENTA-YeS — designing continuous footing beneath the columns of industrial buildings on natural and pile bases using a YeS disk operations system (Belorussian Promproyekt);

FOK-YeS-78 — designing columnar footing on natural, pile, and driven pile foundations using a YeS disk operations system (Kiev Promstroyproyekt);

AVRORA-YeS — automated design of the frameworks of industrial buildings using a YeS operations system (Leningrad Promproyekt);

KORPUS-YeS — automated design of footing slabs on a foundation simulated by two coefficients of footing using a YeS operations system (Leningrad Promstroyproyekt and Kharkov PromstroyNIIproyekt [possibly scientific and design institute for construction of industrial enterprises]);

KOLONNA-YeS — designing prefabricated reinforced concrete rectangular columns using a YeS operations system (Kharkov PromstroyNIIproyekt).

The documents that accompany the package and the programs are included in the sectorial fund of algorithms and programs (Nos I-230 — I-239).

[78-11,176]

11176
CSO: 1863

SPECIAL COMPUTING COMPLEXES FOR CALCULATING DESIGN ELEMENTS

Moscow NA STROYKAKH ROSSII in Russian No 9, 1979 p 60

[Article: "The Central Scientific Research and Design Institute of Metal Construction Elements Recommends"]

[Excerpt] The institute has developed computer complexes for strength calculations to use for computer calculation of the strength characteristics of various types of construction elements. These complexes are very helpful to the designer, making his job easier and improving productivity and quality.

The RASK-YeS computing complex is designed to calculate construction elements of any type which has a rod or plate-rod calculated diagram. The complex can be used to make a static calculation of the element, determine frequencies and shapes of its own oscillations, and to establish calculated combinations of external forces in given sections of units of the piece.

The RASK-YeS is used to calculate the frames of industrial buildings, the designs of the span structures of bridges, loading cranes, transmission line towers, and other installations.

[78-11,176]

11176
CSO: 1863

II. ECONOMIC APPLICATIONS

A. General Treatment

AUTOMATED CONTROL SYSTEMS

Moscow SOVIET EXPORT in English No 2, 1979 pp 32-34

[Article by Yu. N. Karasev, Chief of Department, V/O Soyuzzagranpribor, Ministry of Instrument, Automation and Control System Engineering: "Top Efficiency for Top Profit"]

[Text] V/O Techmashexport Increases Automated Control System Exports Almost 10-Fold Over the Last Five Years

Bulgaria. A branch automated control system is successfully functioning in the Ministry of Electronics and Electrical Engineering here. The Ministry of Mechanical Engineering and Metallurgy has started the experimental operation of an ACS and another one has been put into operation at the Bobov Dol thermo-electric power station. ACS's for production processes at the Elatsite ore mining and dressing works, for traffic control in Sofia and Plovdiv, and for passenger transport in Plovdiv are being installed. All these systems have been developed in the USSR.

GDR. Soviet engineers have designed and are now installing the Polimir ACS at Leuna Werke, which produces polyethylene, a blast furnace ACS at the Eisenhuttenstadt Plant and an ACS for the Sud gas pipeline.

Poland. Soviet foreign trade organizations have supplied automated control systems to the Huta Katowice steel mills, and to the Kupol sulphuric acid factory. Automated systems for controlling a continuous steel casting installation, a textile factory, and other processes and equipment are being built.

FRG. The Salzgitter Company has purchased a Soviet license for production of high-pressure polyethylene and a system for controlling this production--Polimir.

Altogether, upwards of 50 ACS's will be supplied to Bulgaria, Czechoslovakia, the GDR and Poland in 1976-1980. This equipment is also delivered to other countries--Cuba, Hungary, India, Iran, Pakistan, etc.

The USSR: One of the World's Major Designers and Makers of Automated Control Systems

The automation of the control of sections of industry, of production lines and of large-scale machines is being practiced on an ever broader scale all over the world. As industry grows, losses due to the unskilled operation of equipment grow too. Machines are becoming increasingly sophisticated, and many of them are at their most efficient only when they operate on the stability threshold. It is practically impossible to operate this equipment manually.

Engineers approach the automation problem differently--they use automated control and program control systems. And the systems themselves are also different.

As distinct from the traditional Western systems of control and programming, Soviet ACS's are more highly developed systems capable of solving more complicated problems of control. Many of them are integrated and control not only production processes but the economics of production as well.

The USSR manufactured its first production process ACS slightly over a decade ago. Now their number far exceeds 1,000. Such industries, as the chemical, petrochemical, metal processing, mechanical engineering and power, have 100 or more production units and processes controlled by the ACS's. ACS's are also widely used in Soviet foreign trade. The Foreign Trade Ministry and major foreign trade organizations are managed using these systems.

As far as I know, many Western companies still wonder whether it is worth investing in these systems. Many are inclined to regard them just as a tribute to fashion.

The record of the ACS operation in the USSR proves that they are well worthwhile. The expenditure on these systems is returned with profit in two or three years, on the average, with some even earlier. In power engineering, for instance, they justify all expenses in 2.5 years, in ferrous metallurgy in 0.4-2.5 years, and in non-ferrous metallurgy in 1.2-1.8 years. Such a quick effect is achieved thanks to the fact that control automation increases output by 2-4 percent, improves product quality, reduces labor outlays by 5-10 percent, and cuts material and energy consumption by 2-5 percent.

Four ACS's Out of a Thousand

The ACS of the universal beam rolling mill at the Nizhni Tagil Iron and Steel Works saves a million roubles a year. It does three jobs there. First, it controls the heating furnaces by ensuring optimal conditions of ingot heating and feeding in strict conformity with the rolling rate. Second, it controls the operation of the rolling mill cogging stands. And third, it controls the processes and mechanisms of beam cutting and cooling.

Reduced mill idling time, increased commercial rolled stock output and reduced power and material expenditures--all this has effected a saving of a million roubles a year. The quality of rolled stock has improved. Suffice it to say that rolling accuracy is now within +0.05 mm.

The ACS of the continuous steel casting machine at the Azovstal Works saves 1.5 million roubles a year. The system automatically controls all the basic process parameters and eight process loops: the level of metal in the ladle and in the crystallizer, the cooling water flow, billet cutting, etc.

The system does calculations and issues recommendations as to how to optimize the conditions of the secondary cooling of ingots, the billet casting and cutting speed, and ensures that casting process conforms strictly to schedule. Devices giving warning of parameter deviations from the normal make it possible to prevent emergency situations. Besides, the system makes out the accompanying documents and casting charts.

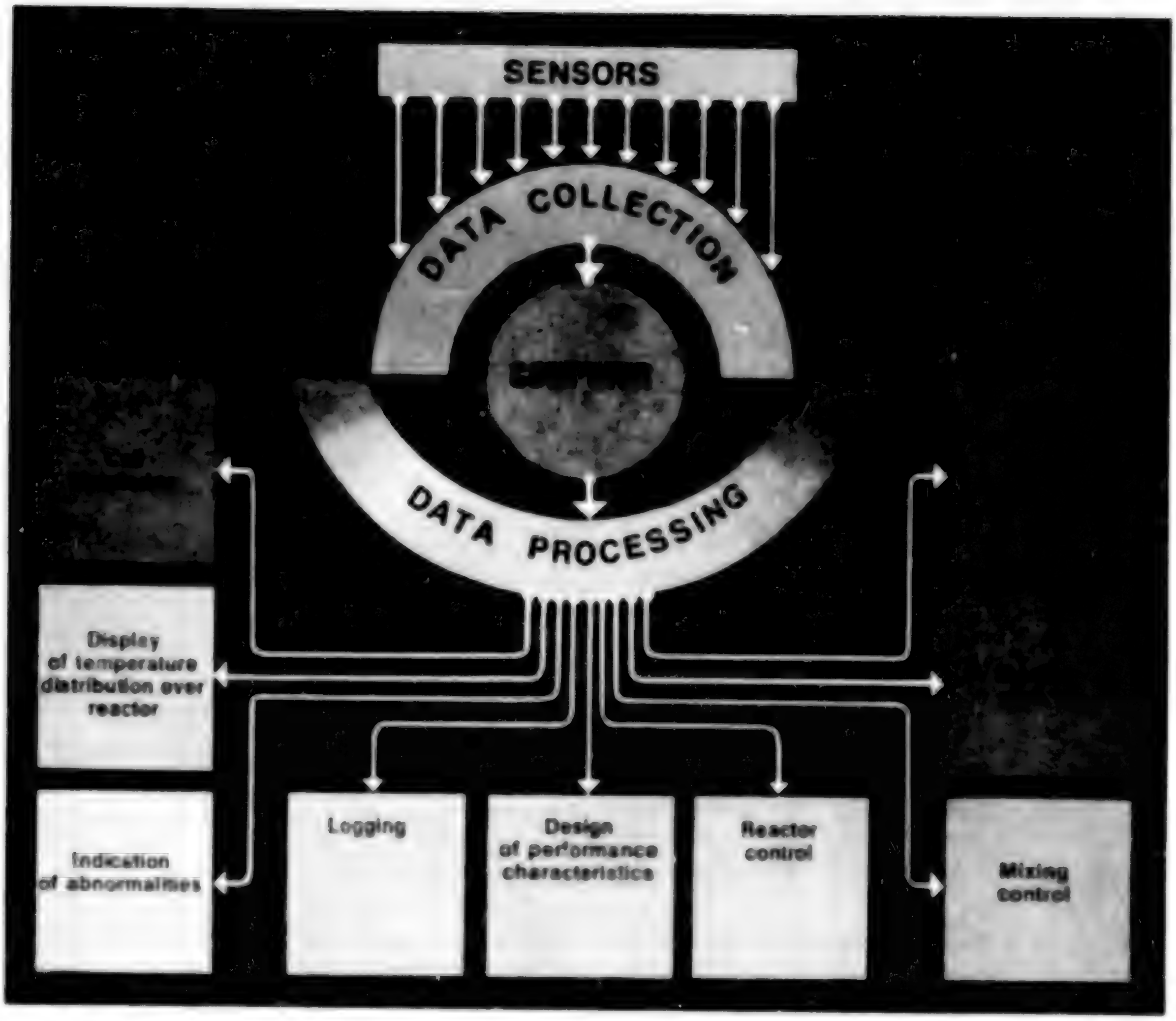
The use of automatic control has made it possible to raise efficiency of the continuous casting machine by 2-3 percent. The output of quality casti gs has increased 1.1 percent. This means an extra 40,000 to 45,000 tons a year. The optimization of secondary cooling conditions has improved the quality of ingots and helped increase the output of quality metal by another 30,000-35,000 tons.

At the Zyryanovsk ore concentration mill, labor productivity has increased 12 percent after the introduction of an ACS. The system controls the content of useful components in ore, maintains the optimum density of suspended matter in the process of flotation, supplies the necessary reagents depending on the content of useful minerals in ore, controls the slime draining processes--in a word, does all the work involved in controlling the production process. But the Zyryanovsk factory's ACS is a higher level system. It handles both process control and production management. It calculates the plan indices of factory operation, takes stock of and analyzes the results of work of all its divisions, etc.

The ACS has made it possible to raise the level of the extraction of copper from ore by [illegible] percent, of lead by [illegible] percent and of zinc by 5.0 percent. Despite the fact that the ores handled by the factory are becoming leaner and leaner, the actual efficiency does not go down. The system saves one million roubles a year.

The ACS of an electric pipe welding unit at the Khartsiz Piping Factory has fully paid for itself in [illegible] years. This system also solves production and economic problems. It ensures the automatic selection of sheets, supervises the transfer of sheets, [illegible], pipes, etc. It takes stock of the metal that goes into production, the quality and quantity of the pipes made, draws up the optimum production plan for a month, three months and a half year, calculates the economics and performance of production and draws up the yearly product shipping plan.

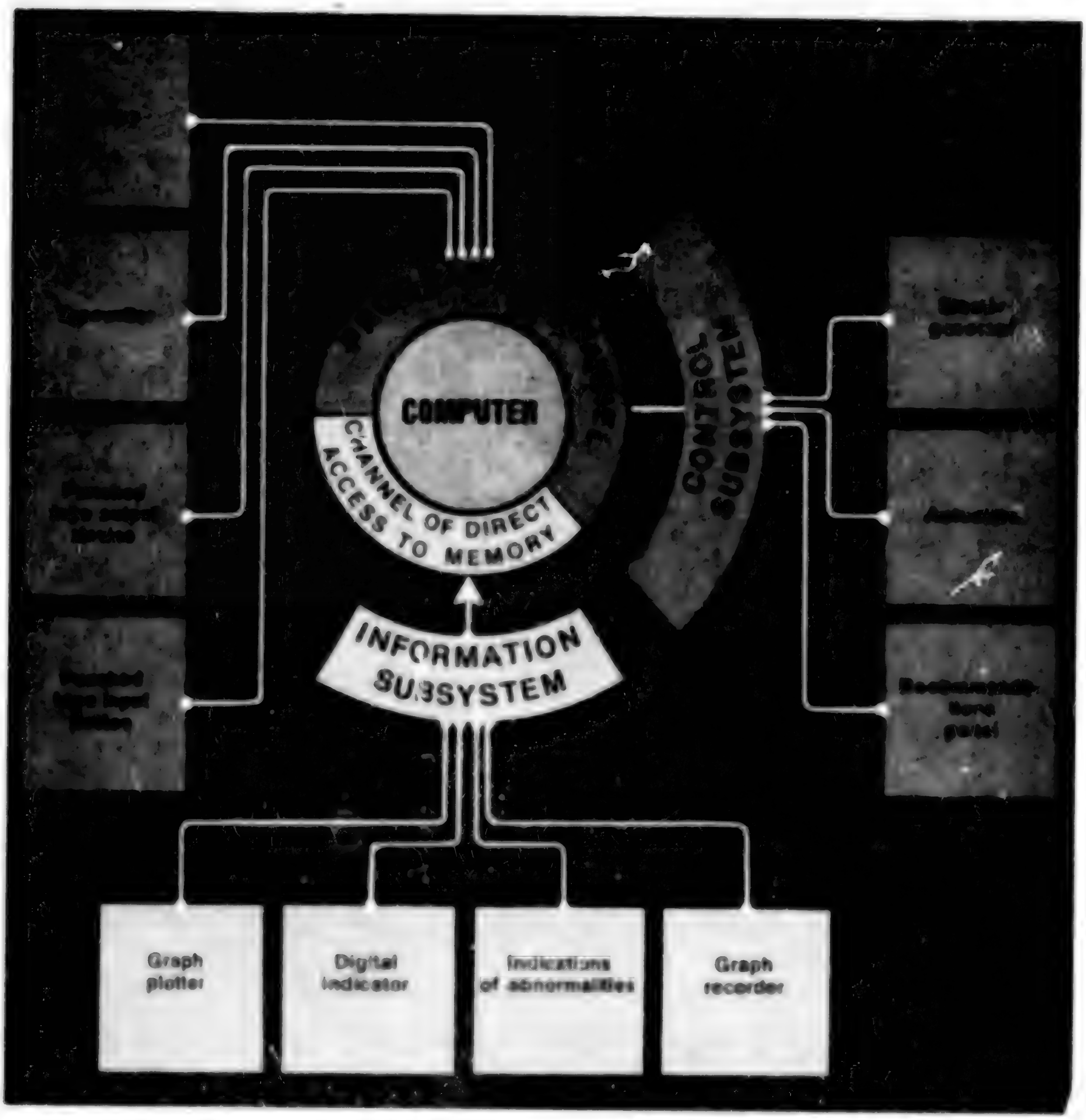
The 12 months of the system's operation have shown that the unit's efficiency has increased by [illegible] percent. [illegible] of metal have been saved on each ton of piping, and the volume of substandard items has gone down by 13 percent.



[illegible] is an example of one automated control system developed in the USSR.

Polimir Automated Control System for High-Pressure Polyethylene Production

Unit (annual capacity 50,000 tons). The Polimir System consists of two subsystems to control the synthesis and [illegible] shops. There are 500 analog and [illegible] discrete sensors connected to the synthesis subsystem which provides graphic information for the operator through displays, digital instruments and graphic recorders, indicates temperature distribution throughout the reactor length, logs the flow of the process, stabilizes the basic parameters, and analyzes the process in pre-emergency situations. The reactor productivity and product quality are calculated by mathematical simulations. The [illegible] subsystem has 210 analog and 240 discrete inputs, and 40 discrete outputs. This subsystem is responsible for monitoring, automatic logging of the production process, working out recommendations for control and subsequent direct control. The general software of the subsystems is standard and is delivered with the computers.



The POLIMIR system is based on the principle of decentralized hierarchy. Its subsystems are interconnected in normal conditions, but if a failure occurs, each of them can operate independently. POLIMIR equipment occupies a floorspace of [illegible] sq.m.

POLIMIR ensures stable polyethylene quality and reliable performance of equipment, and it makes for shortest idling and starting and minimizes the time required for shifting from one work mode to another.

The POLIMIR system has been introduced at the Polimir Industrial Amalgamation in Polotsk (USSR) and is being delivered to the Leuna-Werke Works in the GDR.

Why is It Profitable to Use Soviet ACS's?

The four examples I have just given show how much money the ACS's can save and what they can do. But there are other, no less important factors.

Soviet organizations do all the work involved in the development of automated control systems. This work includes the development of methods and algorithms for controlling the given installation or process, determining the organizational and functional structure of systems, developing hardware, peripherals and external software, as well as new or special means of automation as applied to the object of control, carrying out assembly and adjusting operations, the improvement of software, the training of the customer's staff in the methods of the system's operation, guarantee and post-guarantee maintenance, and subsequent modernization of systems. In other words, the supply of the ACS includes providing the knowhow, carrying out engineering jobs, deliveries of equipment and maintenance services.

The rich experience accumulated by Soviet organizations, and the powerful industrial base of the manufacturers of the ACS's--this is a reliable guarantee of the high quality of all this work.

Large specialized organizations in the USSR take part in working out the algorithms of optimum object control, the software and information means for the ACS and in drawing up the detailed project report. In the Soviet Union ACS problems are dealt with by dozens of R&D centers with tens of thousands of experienced engineers, hundreds of candidates and dozens of doctors of sciences. The mathematical part of the work is based on the successes of the Soviet school of mathematics and theory of control. Algoritams for controlling various processes, worked out in the USSR, are recognized abroad as an achievement in this field. Here is an example. In 1977 a group of Soviet specialists was invited to the United States to pass on their experience of working out algorithms for metallurgical, chemical and other processes.

Soviet R&D centers do all the engineering jobs at the highest level. The experience these centers have accumulated in developing more than a thousand ACS's enables them to develop any system for any industry.

The technical means of the automatic control manufactured in the USSR are of excellent quality. Developed control systems use hundreds of instruments, and sometimes the total quantity of equipment amounts to tens of thousands of units. The effectiveness of control systems confirms the high level of the equipment they incorporate.

The instrument part of the ACS's--pickups and indicators--are based on micro-electronics. The latest pickups of the Sapfir type are a system of electrical unified explosion-proof measuring converters for measuring the thermo-electric parameters of practically any media. Sapfir pickups are distinguished by their immunity to corrosion, to aggressive liquids and gases, by their fast response, reliability and long service life. The pickups' accuracy classes are 0.6, 1.0 and 1.5.

The control systems can be subdivided into the aggregate set of electrical analogue facilities (ASEAF) and controlling electronic computers.

On the basis of the ASEAF Soviet scientists have developed systems for controlling generating units of over 300 MW, large heating furnaces and other equipment. The range of the system using the ASEAF is extremely broad --from the simplest regulators and local loops to large hierarchical systems. The ASEAF has input and output units, functional and regulating devices and operational control units. The mathematical function units, which are part of the ACS, put bounds on signals, select, damp, add, subtract, divide and carry out many other operations. They can use any logical relations and control algorithms. (The ASEAF set is described in detail in SE No. 110-Ed.)

Until very recently, the ACS used control computers of the Integrated Computer System: M-6000, M-7000, and M-4030. Since 1978, new control computer sets are in use. (See an article about these computers on p. 35--Ed.)

Before being sent to a foreign customer the entire ACS is tested at the proving grounds of special Soviet research and experimental centers. This guarantees trouble-free operation of equipment.

The Soviet organizations, which develop and make the ACS, undertake the assembly and adjustment of equipment and software.

Technical service centres have been set up in the countries where many Soviet ACS are at work--Bulgaria, Czechoslovakia and Poland. Similar centers are being built in other countries. Foreign engineers who are to operate automated control systems are trained at Soviet R&D institutes and factories. Soviet experts also train ACS personnel on the spot in local maintenance centers.

At the customers' request we modernize our systems, broaden their functions to introduce new technical facilities.

[illegible] can do any job connected with building an ACS--transfer the know-how, make a design, and supply equipment.

Our automated control systems will optimize your production and increase your profits.
[77]

CSO: 1863-E

UDC 658.5.011.56:658.514

PROVIDING FOR DISPATCHER SUPERVISORY CONTROL OF ASSIGNMENTS FOR THE UNIFIED SYSTEM OF COMPUTERS UNDER CONDITIONS OF AN AUTOMATED ENTERPRISE MANAGEMENT SYSTEM (ASUP)

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 3, 1979 pp 34-35 manuscript received 8 June 78

[Article by Engineer V. A. Chudin]

[Text] The expansion of the YeS EVM [Unified Computer System] applications in the ASU [automated management systems] of enterprises is accompanied by a significant increase in the number of problems which can be solved by ASUP [automated enterprise management systems]. A trend has also been noted towards the representation of the complex of ASUP programs as a set of individual programs (modules), each of which is run for individual assignments, prepared on punched cards.

Under best case conditions, existing data processing technology presupposes the creation of a control program, which organizes the execution of the functional programs of a specific technological information and time chain. In the worst case, the technological tie-in is poorly realized, and considerable time is required to put together and check the assignments for implementation.

The capability offered by the YeS EVM disk operating system (DOS YeS EVM) of recording the assignments on a magnetic disc with their subsequent batch processing likewise has poor efficiency under ASUP conditions. As a rule, it does not meet the requirements for technological processing, especially where solutions have several variants and nonstandard situations occur.

A promising method of data processing on the YeS EVM's under ASUP conditions is dispatching of assignments by means of a computer which combines the major advantages of a control program and the batch formatting of the assignments on magnetic disc.

Based on the scheme for the technological process of the solution of the ASUP assignments, a "qualification" number is assigned to each "assignment": YYY. XXX, where YYY is the assignment level, while XXX is the ordinal number of the assignment. The 001 level is allocated for the assignment with the

highest priority, and the assignment with the lowest priority is identified by the maximum permissible level.

An individual assignment for the execution of a program is prepared on punched cards, taking the following requirements into account:

--The operational input data are excluded from the assignment;

--The /* punched cards, which identify the end of a file, if not especially stipulated, are replaced by /*1;

--To provide for computer operator orientation and servicing, the utilization of commentary controlling operators and PAUSE operators are recommended in the body of an assignment;

--A control operator ASSGN, SYSIPT, X'00C', TEMP, should be present directly ahead of the calling for the program being run, if it is assumed that data will be fed in from punched cards;

--The assignment is identified by the punched title card * YYY.X.X.

All assignments are put together in an arbitrary manner in a reference standard batch of assignments (EP), which are identified by the punched cards of the start (**NACHALO ETALONNOGO PAKETA) [(**START OF REFERENCE PACKET)] and the end of the packet (**KONETS ETALONNOGO PAKETA) [(**END OF REFERENCE PACKET)].

[illegible] the ZAPPAKET program, which is composed in FORTRAN-IV, the reference packet is written on the resident disk for permanent storage, which has a sufficient number of free tracks for the EP [reference standard packet of assignments] (based on a figure of 15 punched cards per packet per track).

[illegible] is fed in [illegible] the [illegible] program (the programming [illegible] for [illegible] control of the assignments, including [illegible] individual assignments, and the layout and execution of the [illegible].

The input [illegible] information [illegible] in the line XXX.XXX...XXX which [illegible] from punched cards or from a console typewriter (PPM). It consists of [illegible] of the XXX assignments from the EP, which are [illegible] in the order of their enumeration. The total quantity of [illegible] in a line does [illegible] the requirements of a [illegible] assignment dispatcher [illegible] in the figure [not reproduced].

[illegible] the generation of the working [illegible] chain from the EP, [illegible] of assignments, and the

[illegible]ilization of a [illegible] during the period of the [illegible] packet run as the permanent device for feeding in the controlling operators of the assignments. The input data for the programs are fed from the working packet, with the exception of those assignments where the designation SYSIPT, X'00C' is indicated. In the latter case, the DISPET is temporarily set up for data reception from the punched card system input unit, by informing the computer operator of this.

A program is located in the computer memory to provide a special instruction to the operator concerning the termination of its use.

The application of dispatcher control of assignments permits an improvement in the technological qualities of the solution of ASUP problems on computers, and the standardization of the production process chains for information processing.

The ZAPFAKT and DISPET programs are employed in the production control at the Volgograd Tractor Plant and the Volgograd Scientific Research and Planning and Design Institute of Machine Construction Technology.
[43-8225]

8225
CSO: 1863

(5584)

UDC 621.3.019.3:62.50.001.24

ENSURING RELIABILITY OF AN AUTOMATED SYSTEM OF MANAGEMENT OF TECHNOLOGICAL PROCESSES IN THE DEVELOPMENT STAGE

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 7, 1979 pp 1-3

[illegible], L. M. and KAVILEVITSKIY, L. G., candidates in technical sciences, and YASTREBENETSKIY, M. A., doctor in technical sciences

[Abstract] The usual goal in designing ASU's [automated systems of management of technological processes] is economic efficiency. The reliability of the system, defined as its capability of performing assigned functions in a given time under definite technical and operating conditions, is a key factor in this efficiency. Industrial ASU's typically have multiple functions performed by separate units, so malfunctions affect only some jobs. Analysis of the ASU must also consider the system's place within the context of the [illegible] and its influence on the ASU's functions. It is convenient in analyzing the ASU to consider separate chains of algorithms related to specific functions; the ASU is the set of these chains. There are various indexes to use for reliability according to the designation of the ASU, consequences of malfunctions, operating conditions, possibility of redundancy by manual control, and the like. These indexes include λ, the intensity of the stream of malfunctions (best for continuously performed functions); T, the time to malfunction (average period of trouble-free operation); $P(t_з)$, the probability of trouble-free operation for a given time period $t_з$; $K_г$, the stationary readiness coefficient. In general it is found that lowering reliability entails economic losses, but raising it requires greater expenditures for redundancy or more intensive servicing. An example is given of the calculation of optimal reliability, using formulas that change an initially discrete problem into a continuous, dual one that is convenient to handle. [References 7 (Russian)].

BRIEFS

CHARGING FOR DOWN TIME--In a note published under this title in No. 24 of the weekly, it was proposed to supplement the U-02-74 price list to include a variable charge for use depending on machine maintenance down time above the established norm. We agree with this proposal. The prices in the U-02-74 price list are established on the basis of the cost of round-the-clock computer use. However, many computers are used for one or two shifts. For this reason the price list should establish a variable charge for technical maintenance depending on the projected mean daily usable machine time that is on the established shifts for computer use. We also support the author's proposal to encourage the improvement of computer maintenance. In our opinion in economic contracts for computer installation and maintenance, projected lost machine time because of down time for maintenance should wherever possible be compensated for by offering use of another computer without cost. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 31, Jul 1979 p 7] 9285 [430-9285]

CSO: 1863

NOVOSIBIRSK COMPUTER TECHNICAL MAINTENANCE CENTER

Riga SOVETSKAYA LATVIYA in Russian 9 Aug 79 p 1

[Article]

[Text] A technical maintenance center that has been set up in Novosibirsk has taken control of the operation of more than 100 computers. Its specialists perform inspections, warranty repair and servicing of computer hardware and telemechanics equipment. This will make it possible to improve the efficiency of utilization of the computer pool and reduce the cost of operating it. Services of the new center have also been organized in other Siberian cities.
[80-11742]

11746
CSO: 1863

STANDARDS FOR OPERATIONS, CHARGES FOR SERVICES AT COMPUTER CENTERS

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 9, 1979 pp 120-122

[Article by V. Maksimenko and V. Simchera, doctors in economic sciences]

[Text] Raised at the 25th Congress of the CPSU was the task "Ensure the further development and increase in the effectiveness of automated management systems (ASU) and computer centers, by successively merging them into a unified nationwide system of acquisition and processing of information for recordkeeping, planning and management"[1]. The timely and high-performance execution of this task depends strongly on improvements in the economic-organizational mechanism of computer center functioning. Correct

1. "Materialy XXV s"yezda KPSS" [Materials of the 25th Congress of the CPSU], Moscow, Politizdat, 1976, p 176.

setting of prices and charges for computer center operations and services has an important role in improving this mechanism.

This problem becomes even more important as existing computer centers are converted to economic cost accounting (and today more than 700 of 3000 existing computer centers have been converted to this basis) and owing to the organizing of shared-time computer centers (VTsKP), the most rational form of computer use.

Prices and charges for computer center services had been based on calculation of the costs of computer operations. Introduced by departmental orders and confirmed in annual contracts for computer work, prices and charges were binding on cost-accounting-based computer centers of ministries and departments performing computer operations for outside enterprises and organizations. As a rule such charges were by and large worked out in machine-hour utilization of various types of computer. Computing centers of the system of the USSR Central Statistical Administration formed an exception where together with a payment for machine-hours, charges were set separately for developing algorithms and programs. These charges significantly vary with respect to various ministries and departments, and at times also within them, and at present cost accounting computing centers are widely used. It is precisely on this basis that many computing centers set up cost accounting relationships, include agreements and service both themselves and outside enterprises and organizations.

Experience in setting prices for computer operations gained in Glavmosavtotrans (Main Administration of Motor Vehicle Transportation of Mosgorispolkom) is of interest, beyond question. Here prices and charges for the individual kinds of operations were differentiated as follows: separate calculations were made of the cost of one computer machine-hour of operation, outlays for performing tasks in scheduling shipments by daily assignments at the level of the automotive transportation enterprise, day-to-day scheduling of maintenance of rolling stock and so on.

Such work was done in Gosplan Latvian SSR and the State Committee for Prices, Latvian SSR, where there is to be a differentiation of existing charges for computer center services by introducing percentage surcharges to the basic charge per computer machine-hour.

Analysis of experience gained in setting standards for operations and charges for computer center services in different sectors of the USSR national economy and abroad, performed in the All-Union Scientific Research Institute for Problems of Organization and Control of the State Committee for Science and Technology, showed the need to improve practices in setting prices and charges based on the considerations mentioned above and present-day operating conditions at computer centers. Quite obviously, it is not in separating, but only by relying on norms for outlays of labor and funds that optimal prices and charges can be worked out.

Now, in our view, we need to work out unified charges for computer center services and fees for operating automated management systems by their main types. A fitting solution to this problem, as we see it, presupposes consistent development of the following:

a unionwide classifier of operations and services at computer centers and automatic control systems, for each of which it is proposed to set individual prices and charges and to engage in differentiated accounts with users

model standards for operations and fees for services and model norms for outlays in time and funds in maintenance of computer centers

unified methodological principles for calculating the costs and setting prices and charges for operations and services of computer centers and procedures for their reexamination and their rate reductions

Some steps in solving each of these groups of problems have already been taken. For example, the All-Union Scientific Research Institute for Problems of Organization and Control drew up and presented for discussion a draft of a Unified Classification of Operations and Services of ASU and Computer Centers. Under this draft, all computer center operations and services are subdivided into 10 groups; within each group 10-12 specific kinds of services are brought together. It is proposed that in the long run the corresponding output norms and planned outlays must be substantiated, and on their basis--prices and charges for each of the kinds of services. Under these conditions, wider possibilities will be available for differentiated servicing of users in accordance with their specific requirements. This approach to classifying operations enlarges the range of automated management system and computer center subscribers and provides better conditions for servicing them.

The State Committee for Labor and Social Problems, jointly with the GKNT [State Committee for Science and Technology], began work in regularizing procedures in norm-setting for labor at computer centers. Under the plan for joint operations in the current five-year plan period, the appropriate institutes of the indicated departments are charged with drawing up Unified Time Norms (Output Norms) for work done with Punched-Card, Keyboard-Calculating and Electronic Computers and Model Norms for Outlays in Maintenance of Computer Centers. These standards (in addition to regularizing wages and the uniform solution of a long series of other important questions of operations of ASU and computer centers) are intended for the setting of prices and charges for computer operations on an objective basis--with allowance for the socially necessary outlays of labor in performing this work.

A great deal of work is underway on collecting, analyzing and generalizing sector standards of extended application, to be used as a base for setting up unified standards. Standards for material outlays are being drawn up in [illegible].

[illegible] important [illegible] computer centers [illegible] Statute on the Socialist Production Enterprise, laying down the basis for settling a set of questions related to uniform setting of prices and charges for computer center services.

Drawing up a temporary price list of unified charges for computer center services is the first stage in this undertaking.

As of 1 Jan 79 a new price list of charges for computer centers has gone into effect; the price list gives, with unified rates of payment per machine-hour of computer operation by kinds of computers, surcharges (rebates) on the established charges for performing additional services. The new price list affects all computer centers, regardless of the kind of work they do [illegible] departmental subordination, [illegible] for other [illegible] that have [illegible] computers on the [illegible]. In comparison with the previous price list, the following separate rate of payment [illegible] of computer operation (see Table).

Accounts between a computer center and a user for services in information [illegible] with a computer [illegible] at the indicated charges based [illegible] filled out as per entries in the computer [illegible] in automatic recording of computer operation [illegible] program, the accounts are kept on the basis of [illegible] sends to the computer center the information [illegible] on machine-processable media.

The price list charges are based on the [illegible] for [illegible] computer services confirmed by Gosplan USSR and the TsSU SSSR [USSR Central Statistical Administration].

Table

Kind of computer	Charges per machine-hour of computer operation based on price list, rubles	
	1977	1979
[illegible]	30	30
[illegible] (basic set)	35	35
ES-1020	80	70
[illegible]	85	85
[illegible]	—	85

YeS-1030	90	85
[illegible]	100	90
YeS-1060	200	110
BESM-6	100	100

The following surcharges (rebates) to the cost of one machine-hour of the main computer complex were set by the price list for specific kinds of additional services:

upkeep and servicing of the software and information support of the user, including complete [illegible] care of the software and information support of user tasks stored at the computer center on machine-processable media ([illegible] percent surcharge)

extension of standard software and access to systems libraries and packages of applied programs at computer centers operating under the control of the main operational system (5 percent surcharge)

[illegible] computations in a day from the time the initial data are presented ([illegible] percent surcharge); computations and display of results in the daytime (from [illegible] to [illegible] on the day the initial data are presented)--[illegible] percent surcharge; at night--[illegible] percent rebate

remote data processing from terminals (subscribers' stations of users) by opening access to users for software and control devices for data transmission [illegible] based on advanced schedule--[illegible] percent surcharge; when there is [illegible] percent surcharge

[illegible] computer centers not provided with the current price list and also [illegible] are performed by computer centers equipped with [illegible] is made according to charges calculated from planned [illegible] and profitability of not more than 15 percent. When a computer center operates in the multiprogramming mode, accounts with users are conducted on [illegible].

The [illegible] price list is a temporary measure. It settles far from all problems associated with computer center operations and the services given users [illegible] computer centers. So much work [illegible] and charges for other, most important kinds of computer center operations and services.

At the [illegible] Research Institute for Problems of Organization and Control, together with involved organizations, is substantiating prices and charges [illegible] the most important kinds of these services. In

particular, at the present time, with the participation of representatives from the all-union associations "Soyuzsistemprom" and "Tsentrprogrammsistem" and the scientific-production association "SoyuzEVMkompleks," an examination is being made of a draft Price List for Developing and Debugging Software for Computer Complexes; after revision, this price list will be presented for confirmation. Work is going on to set differentiated charges and rates for information processing by subsystems of ASU systems, by classes of tasks performed and for processing and transmitting the same volumes of information in different modes (conventional or rush) and in different conditions (by day or by night, at peak periods or between peak periods and so on).

At the same time there is a need also for a more well-defined formulation of the object of calculation (rejection of the machine-hour as an object and switching to objects like subsystem, task or unit of processing and information storage and transmission), revision of the composition of outlays for computer center operations and services and of methods of calculating these outlays, drawing up the economic and legal bases of automated management systems and shared-timed computer centers and so on. Ahead lies the introduction of a new procedure in planning, giving material incentives to and in arranging the economic cost accounting of ASU and shared-time computer centers, special financing of new and the very latest computer equipment and in training cadres of qualified specialists.

A gain in the effectiveness of many solutions in computer manufacture and use in the Tenth Five-Year Plan period and over the long run depends heavily on introducing into regular practice substantiated prices and charges for the full array of services at automatic control systems and shared-time computer centers, by giving incentives for their further development and expansion.
[47-10123]

10123
CSO: 1863

SUITABILITY OF DIFFERENT PLANT AUTOMATED MANAGEMENT SYSTEMS DISCUSSED

Moscow TRUD in Russian 27 Sep 79 p 2

[Article by Academician G. Marchuk, Novosibirsk: "Which ASU a Plant Needs"]

[Excerpt] When a modern enterprise is regarded from the standpoint of management organization, discrete structural levels are readily seen. They are like the floors in a building: plant management, shop, sector, brigade, worker. To assure a maximally efficient production management, the ASU (automated management system) should allow for this multiple tier structure, so as to combine the interests of the enterprise as a whole with the necessary autonomy in decision making at each level. The combining of centralization with decentralization and, on this basis, the democratization of management is an objective requirement of modern large-scale production. It is precisely such comprehensive management that is assured by the Sigma ASU.

The updating of information on the status of production is accomplished at the end of each shift. Plants using the Sigma ASU have streamlined the formerly ponderous accounting systems, and in particular the system of work orders. Every worker is provided with a normative-technological card containing the necessary technical information on a component, the description of technology, and the pay rates for the implementation of every technological operation. Toward the shift's end all data on the technological operations performed by every worker are recorded on the sector's shift report. Following the processing of all of the plant's sector shift reports, new operative information on the status of entire production forms in the computer memory.

A definite procedure has been worked out during the development and introduction of the Sigma. Prior to each work shift notices informing each worker about his earnings for the previous shift are posted in the shops. The worker can check the pay rates for the performance of the technological operation by consulting his normative-technological card. And if the notice provides incorrect information about his performance, this means the information about the components handled also is incorrect. This concerns data on the number of components produced, the quantity of materials expended on their production, the wage fund, etc. The worker reports that his earnings were computed incorrectly, and the entire information about the operation [illegible] to be verified.

The information flow in the Sigma ASU is so designed that the presence of any distortions in the information will directly affect a subdivision or individual worker, so that the error will then be immediately detected and corrected. This procedure assures reliability of information.

After the information on the state of production is updated to conform with the changes in production that occurred during the last shift, control problems can be solved in any sector. The shop or sector chief can use the computer to compare the number of manufactured parts with the plant target, say, with the monthly target and thereupon utilize the findings to determine with the aid of the computer individual tasks for every worker during the next shift. The plant director, in his turn, may compare the available resources with the quantity needed to fulfill the monthly plan, etc.

A major problem in developing the Sigma ASU has been the coordination of management objectives at all levels. To assure this, special regulators were incorporated in the Sigma ASU. The need for them arises when contradictions placing some or other category of participants in the production process in an unfavorable situation appear during the management process.

It is known, for example, that there exists the problem of convenient and inconvenient norms. Improper norming causes considerable loss to enterprises and result in rapid personnel turnover, lack of smoothness in production performance, the need to adopt on-the-spot decisions, dissatisfaction among workers, excess consumption of material resources, and other undesirable consequences. The Sigma ASU has been adapted to transform the regulation of labor norms into an objective and self-sustaining process.

As has been pointed out previously, each worker is enabled to compare his earnings with those of all other participants in the labor process by consulting his normative-technological card and the computer printouts notices of earnings posted in the shop. In the event that a norm for an operation is reduced or raised, the worker has the right to ask for its reexamination. The shop chief and the norm planners receive from the computer all the information on the wage fund and the standards. They are able to estimate with the aid of the computer the expenditures of labor on every technological operation and to adjust the suitability or unsuitability of discrete norms. This regulator meets with support from the workers and from the public organizations. The workers themselves become mass controllers of labor norms.

During the development of the Sigma ASU it was possible to solve a large number of other problems. For example, a system for organizing the manufacture of new products has been developed. Economic-mathematical models of every stage of the manufacture of the new product as well as design information on that product assure automated management of the organization of new production at every stage--from the drawing board to the organization of series production, which markedly reduces the time and funds spent on introducing new production.

The Sigma ASU has been introduced at several large industrial enterprises manufacturing various types of products. At each of these enterprises this ASU has been producing savings of up to half a million rubles a year. Now, however, this is not enough. A transition from data processing systems to systems for optimizing management is needed, that is, a transition to the selection of the best of the existing variants of management decisions.

The decision making itself will remain in human hands. In large-series production an ineffective decision can result in considerable losses. Hence the ASU should become the basis for the adoption of management decisions. The developed network of computers, communication channels, and other facilities should ensure access to computer equipment for all workers at the production-management level so as to enable them to interact with the computer in the dialog mode.

At the same time it is necessary to perfect such new methods for data processing as simulation and optimization. Methods of modern mathematics solve [illegible], with the aid of computers, models simulating the state of production. By means of a model it is possible to obtain a sufficiently objective picture of production for any coming plan period: month, quarter, year, five-year period, and so on. The information provided by such a model, as well as the information on the state of production at any moment makes it possible, with the aid of special programs, to select the optimal, that is, the best variant of the production plan for any coming period. The combining of the methods of optimization and simulation harbors the potential for turning the ASU and computers into a tool for [illegible] decision making. Thus, at the [illegible] plant, where Sigma was first introduced, plan calculations by the plant's main services already are based on the methods of optimization and simulation.

In my opinion, the principal shortcoming in the development of automated management systems is that the ASU is usually simply conceived as a set of a large number of [illegible] tasks [illegible] in the organization of the planning and control of production. Each of these tasks requires its own data bank, so that as many data banks [illegible] have to be set up as there are tasks. This causes tremendous difficulties in the preparation of information and in the compilation [illegible] of ASU programs.

Of course, each of these [illegible] tasks is of major importance to the [illegible]. But the main thing [illegible] a systematic approach and a unified data [illegible] for the [illegible] of the ASU.

It is necessary to develop a common system of interconnected tasks based on a single data bank. This can be [illegible] with the aid of systems employed in the Sigma ASU.

And lastly there is one more important problem. The drafting of the design of a single ASU at present requires the participation of a large number of highly trained experts: mathematicians, programmers, specialists in economic cybernetics, and so on. Such a project usually takes 3 to 5 years and passes through the stages of preliminary examination of the enterprise, compilation of technical task, drafting of blueprints and of working designs, and operating trials, before it can actually be introduced. The expenditures on developing a single ASU are in hundreds of thousands of rubles. But there are no guarantees that the system will produce considerable savings. The varying administrative jurisdiction of ASU designers and insufficient training of experts not infrequently result in that the ASU does not produce the anticipated economic effect. In addition to the unjustified expenditures, in such cases the idea itself of production management becomes compromised.

The Sigma ASU was developed as the base system. It is provided with packets of applied programs for the solution of management problems in any enterprise with a particular type of production: machine-building, radio engineering, instrument making, and other enterprises. When the Sigma is introduced in a new type of production there is no need to duplicate all the design stages. The enterprise ordering the ASU has to provide certain information about its production: volume of output, the data needed to set up an [illegible] base, volume of raw materials used, and personnel--that is, information that is already available at the plant. Thereupon, with the aid of special techniques, the basic program packets are processed in computers and adapted to production management at the enterprise ordering the ASU.

The adaptation and introduction of the Sigma ASU at the Novosibirsk Electrical Locomotive Repair Plant took only about 2 months. The expenditures were only a tiny fraction as high as those entailed in the traditional methods of ASU design. And the Sigma has already produced considerable savings at that enterprise. On the basis of this and other examples we conclude that the focusing of effort on the development of enterprise ASUs should be regarded as justified.

Who then is responsible for the long-term success of the Sigma at the nation's other enterprises? At present the introduction of this new management system is handled by the Central Scientific-Production Association "[illegible]" of the Ministry of Instrument Making, Means of Automation, and Control Systems. A great deal of on-the-spot work remains to be accomplished by the branch and design organizations which directly administer the introduction of automated management systems...
[49-1386]

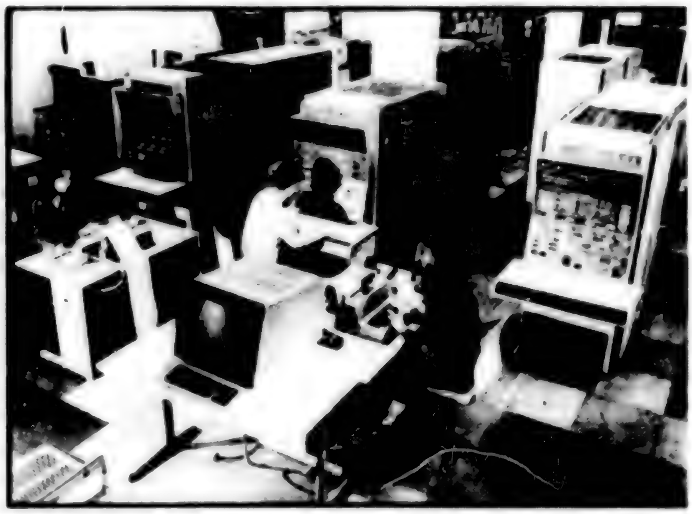
[illegible]
[illegible] 1863

TIME-SHARING COMPUTER CENTER IN ESTONIA

Tallin SOVETSKAYA ESTONIYA in Russian 21 Oct 79 p 3

[Article: "One For All"]

[Text] Acceptance of one of our country's first time-sharing computer centers for experimental operation has been completed. The chief of the Republic Computer Center of TsSU [Central Statistical Administration] of the Estonian SSR R. Pappel', comments on this event.



[118-6521]

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CSO: 1863

IMPROVING INTRODUCTION OF AUTOMATED SYSTEMS OF MANAGEMENT OF TECHNOLOGICAL PROCESSES

Moscow EKONOMICHESKAYA GAZETA in Russian No 18, 1979 p 14

[Article by V. Myasnikov, chief, Main Administration of Computing Technology and Systems of Control, GKNT (State Committee on Science and Technology) USSR, and V. Knyazev, chief of the division: "How to speed the incorporation of ASUPT's"]

[Text] The effective management of the operation of a complex piece of technological equipment, which the enterprises now propose, cannot take place without the use of automated systems of management of technological processes (ASUTP). The incorporation of the ASUPT raises the level of organization of production, insures the possibility of change over to an optimum regime of technological processes, which increases the productivity of the machine units, increases the effectiveness of the use of raw materials and other materials and also averts breakdowns and accidents. The majority of ASUTP's pay for themselves in 1.5-2 years. This fast rate for the system to pay for itself results from increase of production output by 2-7 percent, the decrease in outlay of material resources by 2-4 percent, the increase of capital yield by 2-5 percent, etc.

For example, in the Saran production association "Svetotekhnika" an ASUPT was put into operation to manage the composition of the furnace burden in glass making, equipped with an M6010 microprogrammed automated device. The system produces an annual savings of 130,500 rubles resulting from lower defective output, decrease in input of the components of the burden and savings in wages. The use of the ASUPT allows a savings of 20 percent of workers' labor. Cost of creating the system was repaid in 1.7 years.

In the Arkhangel'sk pulp and paper combine an ASUPT, using an M-600 computer, was put into operation to manage the making of sulphate pulp. The system controls the temperature operating conditions, optimizes the major parameter of the output (pulp rigidity) and stabilizes the outlay of alkali in the apparatus. As a consequence of this the expense of setting up the system, 700,000 rubles, is repaid in 1.2 years.

The direct influence of the ASUPT on increasing the efficacy of production has led to rapid development of work in the creation of these systems. If during the ninth Five-Year-plan, for example, 619 ASUTP's were put into operation, then 1,300 systems are expected to be created in 1976-1980.

Under these conditions, where there is such rapid expansion of work, the reduction in the cost and time to create ASUTP's takes on great significance. Experience shows, that this can only be achieved if a series of organizational problems are solved.

The responsibility of the developers. It is well known that the creation of an ASUTP involves the performance of a complex set of tasks. This includes scientific research and design work, the construction of non-standardized apparatus and devices for automation, the assembly of the technical facilities of the system, installation and adjustment, training the personnel who will use it, putting the system into operation, maintaining and developing it. These tasks are performed by many organizations, at times coming under different Ministries. In the majority of cases no one of these organizations answers for the coordination of the whole complex set of tasks or for the achievement of the planned results of the incorporation of the system.

In our view, the first condition to increase the efficacy of work in creating an ASUTP is the designation of organizations specializing in the development and incorporation of systems for particular groups of technological processes. These must insure the accomplishment of the whole complex of tasks indicated above (either performing them themselves or recruiting other organizations) and guarantee the attainment of a stipulated savings resulting from the use of the ASUTP. Such organizations must include scientific-research, construction and design subdivisions, experimental production, a setup proving ground, and an instruction center for training users.

Each of these organizations could receive the technical devices for the ASUTP from the manufacturer, verify their quality, assemble and test the system under laboratory conditions, and work out a large part of the software. Thus, the delivery of a highly prepared system would be provided. This would allow it to be put into operation very rapidly.

It is also essential to increase the feeling of responsibility of the developers for the development of automation for a group of similar industrial processes. To attain this goal, the industries must designate head designers for the creation of ASUTP's.

Cooperative efforts necessary. Today the design of new complex industrial processes, machine units and production methods, using ASUTP based on computer control technology is universally accepted. The USSR State Committee for Construction, USSR State Planning Committee and USSR State Committee for Science and Technology have defined a new procedure for planning technological projects. It establishes a situation where the design of industrial

processes, machine units and production techniques, equipped with ASUTP's, will take place according to complex programs related to plans for capital construction and confirmed by the customer ministries.

The complex program designates the general project engineers and the organizations developing the technological equipment and the ASUTP, and also the essential volumes and time periods for the completion of the work, providing prompt operationalization of the technological complex.

In the creation of the technical-economic basis and construction-plan the general designer must involve other organizations in the designing of industrial processes, machine unity and production techniques and of the ASUTP so that the basic technological decisions can be made simultaneously.

The interaction of process engineers, creators of technological equipment and the developers of the ASUTP is extremely important, especially at the beginning of the development of the automated technology of the complex. The process engineers must determine which parameters must be controlled and regulated and their boundary values, the possibilities for optimizing the process. The machine builders and the systems engineers must choose the methods for fulfilling the demands of the process engineers and the mutual demands of the industrial equipment and the system of control. Such cooperative work allows the reconciliation of the basic technological decisions at an early stage of the creation of the project and the avoidance of the necessity for making major corrections in the process of project planning.

Overall project planning must culminate in the overall provision of an automated technological complex to the construction enterprise. This insures the satisfaction of the current requirements that the ASUTP be incorporated at the same time the project is assimilated. This enables the project's capacities to be used for new industrial processes more rapidly.

When an ASUTP is created for operating projects the customer is the enterprise. Although, as has already been indicated, the developing organization must carry the responsibility for the fulfillment of the overall task of the creation of the ASUTP, the role of the enterprise is also great here.

Thus for the ASUTP for Factory No. 3 of the production association "Yakutalmaz," the USSR Ministry of Non-ferrous Metals was undersupplied by approximately 100 modules for the M-6000 machine, worth 120,000 rubles in all, in consequence of which the savings amounted to 200,000 rubles instead of the expected 700,000.

Above all, the enterprise jointly with the organization--the developers of the system, must determine the concrete economic goals of automation. The enterprise also provides timely training of the operators of the system and personnel servicing the automated machine and also the shop personnel who

will deal with the system. Finally, the enterprise must provide for the effective use of the system, and jointly with the developers reveal its advantages and disadvantages.

The planning and creation of the ASUTP in the industries must be done in this new way. It is essential for the plans of the industry to take into account the economic saving from the use of the ASUTP: the increase in the output of certain types of production, the increase in the productivity, of labor, the decrease in production cost, saving in raw and other materials and in energy resources. This to a significant degree increases the responsibility of the developers of the systems, as well as of the enterprises which use them.

Changing the way the systems are supplied. The organization of the supplying of the systems has great significance for insuring that the ASUTP's are put into operation promptly and the achievement of the requisite economic saving. Now there are cases where the supplying of systems drags out for a number of years. Related to this are situations where incomplete systems with certain functions unrealized are put into operation. Sometimes a system can simply not be put into operation because of the absence of one or another piece of apparatus. This leads to a significant diminishing of economic savings.

The procedure for supplying the systems operating today does not provide for the prompt and complete delivery of the technological devices involved.

Here the problems with supply can scarcely be explained by the shortage of certain instruments or devices for automation, since the requirements of the ASUTP's for such technology constitutes 7-10 percent of the overall demand of the state economy and can be "painlessly" provided. Evidently, the USSR State Committee for Material and Technical Supply must more fully comply with the order of the "Sovuzsistemkomplekta" of the Ministry of Instrumentation, which equates the provision of ASUTP's with instruments and automation devices to the supplying of projects under construction.

The practice for planning the supply of the technological devices to the enterprises using the ASUTP's also must be changed in some ways. It is essential to establish a procedure for supplying the systems, where the technological devices for the ASUTP would be allocated in full accord with the project and at a time which would allow them to be put into operation on time.

Taking account of the fact that at the present time various normative documents are being formulated dealing with several of these issues, it would be desirable to obtain the suggestions of the specialists who deal with the creation, adoption and use of ASUTP's.
[52-9285]

CSO: 1863

B. Over-all Planning Methods

THE ROLE OF ELECTRONICS IN PLANNING DESCRIBED

Moscow SOVETSKAYA ROSSIYA in Russian 13 Sep 79 p 1

[An excerpt from the article by V. Myasnikov, head of the Main Administration of Computing Equipment and Control Systems of the USSR State Committee for Science and Technology]

[Excerpt] Today, national economic plans contain sections which relatively recently, when discussions were held on the possibilities of using electronic computers, would probably have seemed somewhat unrealistic. I have in mind the assignments of using electronic computers in various sectors of the national economy for the improvement of planning and automation of complex technological processes and industry as a whole. The opinion that electronic computing equipment is, supposedly, not very profitable is quite widespread; however, facts indicate the opposite: the effectiveness of capital investments for creating electronic computers and ASU [automated management systems] is higher than in many other sectors of the national economy. During the Ninth Five-Year Plan, it was planned to save 33 kopecks per each ruble of capital investments into computing equipment, but the actual savings amounted to 40 kopecks. The introduction of electronic computers yielded a total saving of about 1.8 billion rubles. This effect will more than double during the present five-year plan.

ASU are used highly effectively at "AvtoVAZ," "Uralmash," Glavtyumenneftegaz, and many other associations and enterprises. At the gigantic Volga Motor Vehicle Plant, more than 200 problems are solved with the aid of electronic computers. Their ASU paid for itself within a year, and now it saves 13.9 million rubles annually.

Many such examples can be given. Computing equipment has become an integral part of the automation of complex technological processes in chemistry and petrochemistry, power engineering and metallurgy, and in other sectors of the national economy.

The following task is set in the Guidelines for the Development of the National Economy of the USSR during the Tenth Five-Year Plan approved by the 25th CPSU Congress: to ensure further development and to raise the effectiveness of automatic management systems and computation centers, combining them

subsequently into a unified statewide system for collecting and processing information for accounting, planning, and control.

The long-range complex program of the development and use of computer technology is being realized successfully. The statewide automated system will include ASU of all levels: from enterprises and associations to the headquarters of sectors of industry and the union Gosplan. Two hundred large computation centers for collective use will start operating, and appropriate programming services will be provided. This economic strategy is dictated by the needs of our time.

However, the problem of improving the planning and control of the national economy must be solved even at this stage by a more effective utilization of the available computers. There are quite a few of them. For example, in the Russian Federation there are more than 3,000 computation centers and specialized laboratories operating at the present time. How is this potential used?

According to the data of the Central Statistical Administration of the RSFSR, with the norm being 15 hours a day, electronic computers were used last year in the RSFSR Ministry of Personal Services to the Population as well as in the organizations of the RSFSR Ministry of Motor Vehicle Transportation and Highways just a little more than 7 hours a day, in the Gosstroy of the republic -- 6.4 hours, and in oblast and kray executive committees -- 6.3 hours a day. In spite of the low workload of the available equipment, many ministries and departments are equipping their organizations with new electronic computers. This is a standard practice in the Ministry of the Textile Industry, Ministry of the River Fleet, Ministry of Health, and some other ministries of the republic.

This shows that the Russian Federation still does not have a well thought-out, scientifically substantiated, and economically expedient territorial and departmental distribution of electronic computers.

Analysis of the causes of the idling of electronic computers indicate that many instances of idling are caused by careless attitude and weak preparation of enterprises and organizations for the introduction of computing equipment. Specialists are not trained in advance, projects for electronic data processing are not developed, buildings suitable for housing computers are not being prepared. Administrators of enterprises and organizations often do not know in what directions they can use these computers.

The effectiveness of the utilization of computing equipment is also hindered by defects in its manufacturing: shortage of peripheral equipment, high-speed printers, magnetic disk and tape stores, data transmitting equipment, etc. [44-10233]

[illegible],233
[illegible]: 1863

C. Economic Control at Local Level

UDC 658.5.011.56

THE DEGREE OF TYPE STANDARDIZATION OF AUTOMATED MANAGEMENT SYSTEMS IN THE UKRAINIAN SSR

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 3, 1979 pp 41-43 manuscript received 31 Aug 78

[Article by L. S. Lobanova, M. P. Sokolik, Candidates in Economic Sciences and V. D. Shuvayeva, Engineer]

[Text] Setting up ASU's [automated management systems] at all management levels requires considerable material, labor and financial outlays. Thus, the average cost of putting in an ASU at an industrial enterprise in the Ukrainian SSR during 1971-1977 exceeded 400,000 rubles. Planning expenditures averaging more than two million rubles were required to set up the top link of a sector ASU at the ministerial or departmental level. Staffs averaging 140 persons each are engaged in the planning and introduction of OASU's [sector automated management system] in the republic, while in the most sphisticated OASU's, such as the OASU's for the Ukrainian SSR Ministry of the Coal Industry, the Ukrainian SSR Ministry of Ferrous Metallurgy and the State Committee for Agricultural Equipment, these staffs average more than 400 persons each. In this case, a collective of 50 to 100 persons is the most typical for the development and introduction of an ASUP [automated enterprise management system] (for 31 percent of these systems in the republic). The overall labor intensiveness of the creation of one stage of an ASUP averages 200 to 400 man-years. In this case, the length of time to plan one ASU in the republic averages 3 to 5 years or more, while the normative timeframe does exceed 3 to 4 years*.

An industrial approach to ASU design which is based on wide scale type standardization is required for the solution of the problems of reducing the labor intensiveness and accelerating planning operations, as well as because of the necessity of observing organizational, engineering and procedural unity in the developmental work. This permits a more active introduction of progressive economic and organizational forms of management, assures a high

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* V.D. Shuvayeva, V.V. Lobanov, et al, "Nauchno-tekhnicheskiy uroven' avtomatizirovannykh sistem upravleniya v Ukrainskoy SSR. (Obzor)" ["The Scientific and Engineering Level of Automated Management Systems in the Ukrainian SSR. (Review)"], Kiev, UkrNIINTI [Ukrainian Scientific Research Institute for Scientific and Technical Information], 1977.

professional level in the execution of those ASU components such as software, and the more efficient utilization of the technical basis of the system, and additionally, the automation of the process of system development.

In order to assure procedural unity and curtail the time frames for ASU development, a number of standard procedural materials have been developed and are being used at the present time: governing instructions for the development and introduction and a standard typical engineering plan for OASU's (for sectors of industry), sectorwide, governing procedural materials for ASUP design, as well as typical project design solutions for ASUP's and a library of standard programs.

Type standardization of ASU design provides for the development and utilization of typical project plans (TPR's). A TPR is understood to be the typical project planning documentation as regards the economic materials, software and hardware for the ASU, which makes it possible to realize the system planning using the method of combining it with the original project plan documentation, which reflects the specific features of the facility.

A special study was made of ASU's of various types in all sectors of the national economy of the republic, which were placed in industrial service in the indicated period, to ascertain the level of utilization of standard procedural materials when introducing an ASU into the economy of the Ukrainian SSR in 1971-1977, and to estimate the savings in one-time expenditures (for scientific research work and special design work, related to the project planning of the ASU) as a result of using TPR's and packages of applied programs (PPP's).

As the results of the study showed, the governing instructions for the development and introduction of OASU's, the standard typical engineering project plan for OASU's and the governing procedural materials covering an entire sector for the design of ASUP's were employed in all sectors of production.

In only 12 OASU's in the republic's economy were TPR's, packages of applied programs and algorithms and programs borrowed from other similar systems employed in the developmental work. A conclusion can be drawn concerning the extent of their utilization from the following results of the inquiry: 5 percent of the overall number of problems solved were introduced using typical standard algorithms, 38 percent using packages of applied programs and 3 percent using algorithms and programs borrowed from similar systems.

The remaining OASU's in the republic were developed on a custom-made basis.

The most advanced positions in the field of TPR utilization are held by the OASU's of the Ukrainian SSR Ministry of the Coal Industry, the ASU of the MTS [material and equipment supply administration] of the Gossnab of the Ukrainian SSR, the OASU of the Ukrainian SSR Ministry of Motor Vehicle

Transportation and the OASU of the Ukrainian SSR Ministry of Ferrous Metallurgy. Thus, of the 48 problem areas handled in the OASU's of the Ukrainian SSR Ministry of the Coal Industry during the years of the Ninth Five-Year Plan, 62 percent were handled using standard type algorithms, while 79 percent through the use of packages of applied programs. In this case, a savings was gained in the one time outlays of more than 450,000 rubles. Of the 447 assignments handled in the ASU of the MTS of the Ukrainian SSR Gossnab during this period, 95 percent were introduced using packages of applied programs, something which permitted a savings of more than 500,000 rubles.

The analysis which was performed made it possible to obtain an empirical estimate of the average savings due to the use of one standard type project plan solution in an OASU (about 4,500 rubles).

Some 67 ASUP's were studied to assess the level of type standardization of ASUP's placed in industrial service during 1971-1976 in the system of union-republic and republic ministries and departments of the Ukrainian SSR. As a result, it was ascertained that during their creation, 25 percent of all problems solved were introduced through the use of TPS's; 25.4 percent by using packages of applied programs and more than 16 percent using algorithms and programs borrowed from similar systems. The savings resulting in this case in the one-time outlays were more than 4 million rubles as a result of the use of standard type materials and programs.

The Level of ASUP Type Standardization

Indicators	1971-1975	1976	1977
The extent to which the ASUP's are encompassed by standard project design solutions, percent	45	56	66
Percentages of the assignments carried out in an ASU, in percent:			
Based on TPS's	23.6	26.6	26.4
Using packages of applied programs	26.4	10	33.2
Using algorithms and programs borrowed from other systems	16	6	28.4

The greatest savings were obtained in the coal industry of the republic (more than one million rubles in 14 ASUP's), in power engineering (835,000 rubles in 6 ASUP's) and in the State Committee for Agricultural Equipment (880,000 rubles in 11 ASUP's). An active process of providing copies of the project plans is underway here.

The utilization of TPR's has made it possible to obtain quite perceptible savings for the one-time expenses in the project planning for ASU's at ferrous metallurgy enterprises. Thus, in the project planning for the first stage of the ASU of the Zhdanov "Azovstal'" metallurgical plant, it amounted

to 60,000 rubles, 50,000 rubles at the Krivorog Metallurgical Plant imeni Lenin, 45,000 rubles at the Zhdanov Metallurgical Plant imeni Il'ich, etc.

As the analysis demonstrated, the average savings due to the use of one TPR (assignment) in an ASUP in the republic amounts to 2,100 rubles.

The dynamics of the level of utilization of TPR's in the design of ASUP's in the Ukrainian SSR are shown in the table.

The extent to which the project plans for automated management systems were encompassed by standard type design solutions was greater in 1977 than in the Ninth Five-Year Plan and in 1976. This is evidence of the established trend towards a transition to industrial methods of ASU development.

Thus, the utilization of TPR's in the development of ASU's sharply curtails the outlays for the system design and consequently, the capital investment recovery period. However, as experience with their utilization has shown, the differences in the organizational levels of production and management in the industrial sectors and at the enterprises are becoming an insuperable obstacle in path of TPR introduction. This is especially characteristic of problems of operational calendar planning, tooling up for production and bookkeeping, in view of the differences in the operational planning systems, and the incorporation of changes in the technological documentation and time accounting.

It follows from this that the major sections in the engineering and economic substantiation of the expediency of ASU introduction at any facility should be the following: a comparative analysis of the economic impact of the various approaches to the planning and configuring of an ASU, the determination of the basic measures to be taken as the obligatory conditions for the project planning preparation to refine the organization and management of the facility where the ASU is introduced, by working from its organizational and engineering characteristics. This will facilitate a changeover to industrial methods of ASU design and planning, and the wide-scale utilization of TPR's. It is proving expedient to develop intersectoral materials for the preparation of various national economic facilities for the installation of ASU's. In this case, it is essential to provide for the development of methods of quantitatively evaluating the economic and organizational-engineering level of management objects for the purpose of developing formal procedures to determine the expediency of introducing an ASU and making recommendations for the utilization of TPR's.
[45-8225]

8225
CSO: 1863

D. Extractive Industries, Fishing

UDC 622.75/77:65.011.56

PROJECT PLANNING FOR A COMBINED MANAGEMENT SYSTEM FOR THE SECTION LOAD MODES OF A MAGNETIC ORE CONCENTRATION FACTORY

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 3, 1979 pp 16-17 manuscript received 7 Aug 78

[Excerpts from the article by V. I. Vertegov, candidate in technical sciences and V. A. Knizhnik and N. B. Sukhorzhevskiy, engineers]

[Excerpt] One of the requirements placed on ASUTP's [automated systems for the management of technological processes] in the concentration industry is the simultaneous improving of the operational timeliness and precision in the calculation of the load modes of facilities under conditions of piecewise--steady-state fluctuations in the properties of the raw ore.

A combined management system* is considered below for the loads on a section, which meets this requirement, taking into account operational timeliness precision in the monitoring of the parameters. A combined principle of adaptive and situational control is taken as the basis for the functioning of the system.

A block diagram of the combination management system for section loads is shown in the figure [not reproduced]. Some seven independent circuits to stabilize the pulp density operate in the system, where these circuits are designed around a complex of electrical analog control equipment (AKESR). This allows for a reduction in the size of both models and the singling out of the parameter g_p (the OR load per section) as the main controlling action, as well as an external circuit for the operationally timely calculation of the g_p loads, which is closed through the SM-2 control computer complex (UVK), and realized algorithmically.

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* The system is incorporated in the structure of the ASUTP of the "Obogashcheniye" [Concentration] Factory of the Korshunovskiy GOK [Mining-Concentration Combine].

The monitoring of the overall iron content in intermediate products, in the concentrate and in the tailings (wastes) in the system is accomplished using the KRF-18 X-ray quantometer, which operates in conjunction with the M-6000 computer. The delivery of concentration products to the quantometer is accomplished by the centralized sample taking subsystem, which operates in both an M-6000 initiated mode, and at the request of the operator. The information is fed directly to the SM-2 from the M-6000. The utilization of the parameter--the overall iron content instead of the magnetic one--introduces minor errors into the calculations, since the content of slightly magnetic inclusions in the ore is insignificant (on the order of 2-3 percent with an overall iron content of 24-32 percent).
[45-8225]

8225
CSO: 1863

E. Manufacturing and Processing Industries

USSR UDC 62-50:519

SYSTEMS APPROACH TO JOINT DESIGNING OF CHEMICAL PRODUCTION SYSTEM AND SYSTEM OF AUTOMATIC CONTR

Moscow PRIBORY I STEMY UPRAVLENIYA in Russian No 7, 1979 pp 3-5

KAFAROV, V. V., academician, PEROV, V. L., doctor in technical sciences, MANDRUSENKO, G. I., candidate in technical sciences, and PUSTOVALOV, G. M., engineer

[Abstract] The designing of economical large, high-intensity chemical production units is an important problem today. Experience shows that it is best to combine design work on the production unit and the system of automatic control (SAU) to make one closed-cycle system. This reduces planning time and results in better integrated plans. The specific problem of the systems approach to combined designing of a chemical production unit and a control system is to determine the optimal structures and technological parameters most fully satisfying the given efficiency criterion while upholding the conditions necessary for functioning of the combined system. Raw data for the design process come from systems analysis of production and SAU experience; the efficiency criterion is also selected at this stage. The conditions of controllability, observability, and stability are important features that must be maximized in the system. Flowcharts of the design process are given, followed by an example of a hydroformylation unit. The analysis suggested modifications related to technological requirements, controllability, and observability. Two variants emerged and the selection was made by the optimality criterion of profit from output. Figures 4; references 13 (Russian).
[431-11176]

11176
CSO: 1863

USSR UDC 65.011.56:681.3:681.11

OPERATIONAL CONTROL OF PRODUCTION WITH A FUNCTIONING AUTOMATED ENTERPRISE MANAGEMENT SYSTEM

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 7, 1979 pp 7-8

KAZANTSEV, A. V., director of the Minsk Clock Plant imeni 60-Letiya Kompartii Belorussii

[Abstract] The Minsk Clock Plant, one of the country's largest producers of wristwatches, was also one of the Ministry of Instrument Making, Automation Equipment and Control Systems' 13 initial sites for ASUP's [automated enterprise management systems] in 1969. The plant's ASUP today has nine subsystems producing 306 different documents, including 24 every day, 27 each 10-day period, and 158 every month. The subsystem for operational control of production is a key part of the ASUP. It makes up plans by item for the sections and shops, and these provide the basis for plans by assortment and volume. Recording, analyzing, and regulating the course of production are the main functions of the system. Each day each section foreman and shop chief receives a report showing fulfillment of the plan by item, volume (in rubles), and percentage. The plant administration receives daily reports relating data on shipments, sales, and plan fulfillment by shops, sections, and the like. In 1973 special record cards were introduced for data collection in the sections. The plant uses decentralized data preparation which eliminates keypunch and checking work at the main office. Thus, reports are ready soon after the shift ends, not the next morning as is true at plants with centralized data preparation. The plant administration publishes a daily bulletin for management personnel. The value of the ASUP is evidenced by the estimated annual saving of 450,000 rubles it gives. Anticipated improvements are (1) enlargement of computer capacity by introduction of third-generation equipment; (2) integrating the processes of recording and feeding raw data; (3) raising the reliability of the hardware.
[431-11176]

11176
CSO: 1863

USSR UDC 658.562.018.2:681.3:51.007

EXPERIENCE WITH DEVELOPMENT AND INTRODUCTION OF THE COMPREHENSIVE PRODUCTION QUALITY CONTROL SYSTEM AT THE TOCHELEKTROPRIBOR PRODUCTION ASSOCIATION

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 7, 1979 pp 39-40

KHOMYAK, V. A., chief of the special design bureau of the association, Candidate in technical sciences

[Abstract] The Kiev Tochelektropribor [Precision Electrical Instrument] Production Association began work on a quality control system in 1963. This has now developed into a comprehensive system for quality control managed by a special quality control burea (byuro UKP). This system is based on a set of standards: the basic model and organizational and technical standards. The first phase of the comprehensive system was launched in late 1977. It covers all vital stages of the life of products, from design through preparation for production, production, and sale, to actual use. Before an item is designed, information is collected from users, labs, and production workers concerning the contemplated item. Efforts to standardize parts and assemblies used have been successful in reducing the total number of such items manufactured. Several departments monitor the production process closely. Improved quality is promoted by special Quality Days and meetings of the standing commissions on quality of production subdivisions. Socialist competition emphasizes quality and the payment of bonuses is based on a special coefficient K of work quality. Results of the association's operations in recent years confirm the effect of the comprehensive quality control system. For example, all new items introduced in production in 1976-78 were recommended for the State Mark of Quality.
[431-11176]

11176
CSO: 1863

ANGARSK ELECTROMECHANICAL PLANT COMPUTER'S FUNCTIONS DESCRIBED

Moscow IZVESTIYA in Russian 19 Sep 79 p 1

[Article by L. Kapelyushnyy, special IZVESTIYA correspondent, Angarsk, Irkutskaya Oblast: "The Angarsk Method"]

[Excerpts] Heavy containers with computer units arrived at the receiving door of the Angarsk Electromechanical Plant. But the specialists of the plant's automated management system (ASU) did not settle for waiting for Monday. On Saturday they got down to dragging the containers into the computing center, unpacking them and installing the equipment.

Angarsk electrical engineers produce magnetic stations. They are also called enclosed low-voltage equipment--NKU.

In the current year almost one third of the NKU produced in the country will be manufactured with the Angarsk name. Furthermore it is all being fabricated in keeping with individual orders. In a certain sense the plant reminds one of a custom tailoring shop--each client has his own needs, capabilities and features. The design documentation for magnetic stations is made by about 5000 organizations.

Every year the plant ships 91,000 stations which are custom-made.

Computer technology helps to maintain strict order. When, for example, NKU for a drilling unit or marine refrigerator is being put on the conveyor belt, the computer rapidly determines how many and which parts are required for this.

But the computer's obligations are not exhausted by its traffic control functions. It works also as an assembler. Imagine that you have to assemble an electrical equipment board. In the assignment is indicated what must be mounted and what kind of wiring is to be done. But before you take a tool in your hands you have to understand the wiring diagram and determine the sequence of operations. These preparatory operations take up 60 to 80 percent of the time. At the Angarsk plant the arrangement of units on boards, the routing of wiring and the marking of wires is done by the computer.

The computer has also been entrusted with seeing to the preparation of documentation for production. Having received the information on an order, the computer determines the number of necessary parts and materials, makes installation diagrams and even performs part of the design work. And also, what is very important, it determines the price. Indeed, the cost of each station is different, and at kindred enterprises this work is done by departments made up of a few dozen people.

In the 3 years of the five-year plan period the plant's ASU has produced a savings of 1.8 million rubles.
[42-8831]

8831
CSO: 1863

PRODUCTION CONTROL INFORMATION AND REFERENCE COMPLEX

Riga SOVETSKAYA LATVIYA in Russian 22 Sep 79 p 2

[Excerpt from article by Yu. Krokhin, Novosti Press Agency]

[Text] The Mineral Fertilizers Production Association imeni V. V. Kuybyshev, which is one of the giants of Soviet chemistry, is located in the Moscow suburb of Voskresensk.

Efficient control of the shops and services, complex production equipment, power management and product marketing of such a huge industrial organization is very complicated without the help of automatic equipment. In order to lighten this burden, an automated management system (ASU) for sulfuric acid production, the "Kupol" ASU, was introduced in the association.

Today the "Kupol" is a component part of an extensive management system that has received the title "Disk" (production control information and reference complex).

"'Disk'," says Chief Designer Aleksandr Vasyutchikov, "is the first automated system of its type for managing a basic chemistry enterprise. It encompasses the administrative and management activities of the entire association, coordinates three production facilities--for sulfuric acid, ammonia, and mineral fertilizers--and anticipates emergency situations. I will illustrate this with an example. The working rhythms of two interrelated shops can turn out to be at variance with each other. As a result, it is possible for there to come a time when a storage facility (for, let us say, sulfuric acid) is either overflowing or is being emptied. This leads to a shutdown of the shops, which affects the regularity of operations. Our 'electronic assistant' enables us to make an accurate determination of the time when such a situation will occur, which means that we can prevent it."
[80-11746]

11746
CSO: 1863

INDUSTRIAL MANAGEMENT SYSTEM

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 25 Sep 79 p 2

[Article by D. Pipko, editor of the scientific-technical information department of the newspaper: "Maneuvering Algorithm"]

[Excerpts] An integrated sector automated management system (ASU), using collectively used computer centers, is being established at the Minenergomash [Ministry of Power Machine Building].

In its operation, the Ministry of Power Machine Building uses data collected, generalized and analyzed by means of a computer, making up an industrial "ASUenergomash" [Automated Management System for Power Machinery Building]. But it would be useless for you to attempt to discover these computers in the buildings of the ministry, or in Moscow in general. The Main Information-Computer Center [GIVTs] of the Minenergomash does not have its own computers. One may ask then, how will such an industrial ASU function?

The initial "ASUenergomash" project was developed along the traditional arrangement--with the main computer in Moscow. Judging by the experience of other ministries, the development of only the first stage of such a system would require not less than 5 years. Yet, the Minenergomash felt a sharp need for a computer to solve management problems. What to do? Rent machine time from some capital organization? This is not a solution. It was decided to try and utilize internal reserves of the industry.

An analysis of these reserves indicated that they were quite impressive. Some 16 computer centers were already in operation in associations and large enterprises at the time the Minenergomash was organized. Their staff workers accumulated a great deal of experience in solving management problems, but only on a level of the ASU enterprises. Going to the sector level was beyond their capacities. When it is taken into account that some of the computer centers were loaded only 50 to 70 percent, the conclusion was obvious--until a sector system is created, use them for the problems of the ministry. However, the staff workers of the GIVTs went further. They put forward a daring proposal--tie all computer centers into a single system equivalent to a sector ASU by means of communications facilities.

"The integration of the "ASUenergomash" and the ASU of enterprises rests upon a single data, software and equipment base," stated Ya. Ryndin, the GIVTs director. "Already, at the creation of the technical project of the system, we have come to the conclusion that its possibilities were considerably broader. In particular, the integration of management levels made it possible to integrate all problems that determine the activity of the industry--starting with the development of power equipment and ending with the sale of finished products..."

The implementation of this concept requires a more extensive scientific approach, a more rigid theoretical substantiation and a corresponding mathematical staff. Therefore, the Minenergomash and the Ukrainian SSR Academy of Sciences concluded a contract to develop an integrated sector ASU on the basis of fundamental research by the Cybernetics Institute of the Ukrainian SSR Academy of Sciences.
[103-2291]

2291
CSO: 1863

A COMPUTER SERVES THE PRODUCTION PROCESS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Oct 79 p 2

[Article by I. Ivanov, Novosibirsk]

[Text] The first stage of an automated production management system has gone into operation in the leading enterprise of the Ob' Leather and Footgear Production Association in Novisibirsk. It is based on a YeS-1022 computer.

The illuminated indicator boards are clearly visible from each work place. The numbers on them constantly show how the production assignment is being fulfilled on one flow line or another and how many articles are being produced relative to the plan. In 1979 the association will produce 30,000 pairs of footgear and 400,000 square decimeters of chrome [tanning] and women's leather above its quota.

The automatic equipment made it possible to direct the work of the shops and flow lines on a more operational basis.
[80-11746]

11746
CSO: 1863

F. Transportation System

UDC 656.222.3.681.32-523.8.011.8

SUBWAY AUTOMATED MANAGEMENT SYSTEM; NAIRI-K COMPUTERS MODIFIED FOR MOSCOW RAILROAD MARSHALLING YARDS

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 9, Sep 79 pp 3, 28-29

[Excerpts from articles: by V. D. Vodyakhin, chief, Department of Automation, Signaling and Communications, Main Subway Administration of the USSR Ministry of Railroads: "Automation on the Subway"; by B. Kh. Tsirlin, N. M. Krutman, Deputy Department Chiefs of the Moscow Railroad Computer Center and V. V. Kashkarov, Chief Engineer: "The Utilization of the 'Nairi-K' Computer in the Marshalling Yards of the Moscow Railroad"]

[Excerpt] The economic gain from the operation of ASU-Metro [Subway Automated Management System] according to preliminary calculations is characterized by the following indicators: the annual economic effort is 1.0 million rubles; a capital investment recovery period of 3.1 years; and an expenditure efficiency factor of 0.32.

The Utilization of the "Nairi-K" Computer in the Marshalling Yards of the Moscow Railroad.

"Nairi-K" computers are being used to automate the compilation of railroad documentation in the marshalling yards of the Moscow railroad. The production process schemes and the set of programs developed in the computer center permit the solution of this problem for long and heavy trains.

Various operations are performed with the "Nairi-K" computers in the marshalling yards: checking the correctness of the composition of the full-scale lists for the arrival of trains and the execution of the plan for their formation upon arrival and departure, and accounting by number for the cars in the yard. Moreover, full-scale lists are drawn up for departing trains as are information sheets on the presence of cars on the yard tracks, as well as in trains which have arrived for reforming and have already been formed up.

Both the slow speed of the "Nairi-K" computers (a few thousand operations per second) and the low efficiency in the processing of large information files because of the pagewise organization of the main memory (OZU) were taken into account in the development of the process for solving the task and the

development of the program package. There is no capability for program control of the switching in and out of peripherals (the PL-80 perforator and the FS-1501 photoelectric reader) or for the input and output of data in the MTK-2 code in the series produced computers.

In order to eliminate these defects, work was carried out to modernize the "Nairi-K" computer. First of all, algorithms were worked out for new microroutines: integer multiplication and division, the copying and formation of data files, the switching in and out of peripherals, etc. The information input-output system was also reworked, as a result of which it became possible to increase the number of peripherals operating in different codes (Nairi-6, MTK-2, KOI-7) which can be connected. Additionally, a circuit was designed for interfacing two "Nairi-K" computers. This refinement significantly curtails the time expended for the solution of problems, since now the "approach" and "arrival" problems are solved on one computer, while all the remaining ones are solved on the other. Moreover, in case one of the computers fails, the other is used.

Information exchange between the two computers is realized at the initiative of the operator and accomplished by a specially developed microroutine. The circuit changes required with its introduction are shown in the figure [not reproduced].

The information exchange process begins with the execution of the write (PD) or read (PS) instruction, in which the initial address of the exchange and the number of transmitted store locations are indicated. The first computer, carrying out one of these instructions, interrupts the operation of the second computer upon the arrival of the signal from the TgPA flipflop. The latter is set to the zero state by the signal from the interrogating computer. In executing the next instruction, it analyzes the state of the TgPA flipflop. If the flipflop is in the zero state, information exchange is begun. The exchange is realized "bit by bit" in an asynchronous mode. The 36 bits are transmitted sequentially. After this, the received information is written into the indicated address in the interrogated computer.

The number of information transmit cycles is determined by the number of storage locations specified in either the PD or PS instructions. The exchange time in the case of the rewriting of 4,096 storage locations amounts to about 20 seconds and the time for the output of the data of the full-scale list is about 2.0 minutes.

A DZM-180 printer was connected to the "Nairi-K" computer to speed up the printout of the full-scale list. In this case, the time was reduced to 30 seconds.

[46-8225]

8225
CSO:1863

G. Construction

DEVELOPMENT OF AUTOMATED SYSTEM OF MANAGEMENT OF CAPITAL CONSTRUCTION

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 7, 1979 pp 21-27

[Article by Chan Chung Ngia, candidate in economic sciences, Assistant Director in Scientific Work of the Kazakh departnent of the State Scientific Research Institute of Automated Systems of Planning and Control (NII system): "A Systems Approach to the Control of a Sector:" Scientific Developments in Operation"]

[Excerpts] The staff members of the Kazakh department of the State Scientific Research Institute of Automated Systems of Planning and Control (NII system) in close contact with workers in the Administration of Capital Construction of the Glavrissovkhozstroy (expansion unknown) of the Ministry of Water Management of the USSR (city of Alma-Ata) and in the Kazakh Ministry of Energy, in recent years have attempted to develop and incorporate an Automated System of Management of Capital Construction (ASU KS).

The system has been developed on the basis of DOS/YeS (supplementary operational system of a unified system of computers) (version 13). The programs are written in the algorithmic language PL/1.

In this case the criterion of optimality for the plan for capital construction is minimum outlays of capital investments.

A package of applied programs in linear programming [PPP-LP] developed by the NII system was used to solve this problem on the computer.

The system underwent a trial use in the Glavrissovkhozstroy of the Ministry of Water Management of the USSR (city of Alma-Ata) in 1977 and in 1978 was accepted by the State Commission for Industrial Use.

At present it is being incorporated in the Kazakh Ministry of Energy. In the near future it will be operational in the Kazglavvodstroy of the Ministry of Water Management of the republic, in the Glavdal'vodstroy of the Ministry of Water Management of the USSR (city of Vladivostok), and in the Ministry of Non-ferrous Metals of the USSR and Kazakh SSR.

The yearly savings attributable to the system comprises from 50,000 to 1.2 million rubles (depending on the extent of capital outlay, 400 - 1000 million rubles respectively) because of the decrease in time to erect projects, decrease in number of uncompleted construction, rational use of material and labor resources.
[52-9285]

9285
CSO: 1863

H. Supply System

BRIEF

AUTOMATIC INVOICE PROCESSING--At the present time in organizations dealing with material and technical supply a new uniform type of goods and transport invoice (TTN) is being introduced. Working with them necessitates additional expenditure of times and labor, which has lead to some organizational problems. A number of UMTS's (Main Administrations of Material and Technical Supply) make use of computer technology to fill out the new invoices. The processing of income and expenditure documents requires a significant amount of time. For 4 years, in our computer center we have been successfully using a completely mechanized processing procedure before feeding them to the computer. The devices used for this procedure are: the "Optima-528" and "Zoyemtron-385" automatic control devices, the "EFA-383" automated invoicing devices, card indexes of suppliers and products and linkage channels. Information about suppliers and product lists is kept in books and on punched tape. Dispatch of goods and accompanying documentation is accomplished at the center in the following manner: In accordance with the requisite specifications for the allocation of capital the senior engineer writes out a tag which takes the place of the dispatch order. The dimensions of this tag are a quarter of the standard size and it contains only the most necessary specifications of supplier, user, goods administration, warehouse, TTN number, date and quantity for dispatch. The tag is immediately sent to the invoicing group where it is used to locate in the card index the punched tapes with specifications of user and good characteristics. Even with a large metal products list the search proceeds very quickly. The punched tapes are printed out six to eight at a time in the appropriate sequence on the left side of the TTN on the "OPTIMA-528" device. Three operators using two such devices can fill out 250 TTN's per day. Afterwards, they are turned over for documentation completion and then to the warehouse for dispatch. Since there are limitations on the EFA-385's punched tape memory, it can be effectively used where the most frequently occurring number of product users does not exceed 500 and the product list on one automated device is 300. [Excerpts] [Moscow MATERIAL'NO-TEKHNICHESKOYE SNABZHENIYE in Russian [date unknown] pp 59-60] 9285
[410]

CSO: 1863

I. Trade

BRIEFS

ACS ADVERTISEMENTS--Know-how, engineering and technical facilities for automated control systems--V/O Techmashexport, 35 Mosfilmovskaya Ul., 117330 Moscow; Telex: 7568. [Text] [Moscow SOVIET EXPORT in English No 2, 1979 p 34] --Automation of production at factories built abroad by Soviet organizations is carried out by V/O Prommashexport, 18/1 Ovchinnikovskaya Nab., 113324 Moscow; Telex: 7532. [Text] [Moscow SOVIET EXPORT in English No 2, 1979 p 34]

SM COMPUTER ADVERTISEMENT--The new controlling computer complexes are exported by V.O Techmashexport, 35 Mosfilmovskaya Ul., 117330 Moscow; Telex: 7568. [Text] [Moscow SOVIET EXPORT in English No 2, 1979 p 37]

TRADE COOPERATIVE INSTALLS YeS-1022's--The information-computer center (IVTs) at the Krasnodarsk Kray Union of Consumer Trade Cooperatives has been equipped with two YeS-1022 computers. [Summary] [Moscow KOMMERCHESKIY VESTNIK in Russian No 17, 1979 p 34]

[77]
CSO: 1863-P

J. Agriculture, Water Management, Land Reclamation, Sylviculture

BRIEF

NEW COMPUTER CENTER--Kaluga. The first model building for a regional information-computing center in the Ministry of Agriculture of the RSFSR has been authorized to be put into operation, having received a grade of 'good.'

The major part of the work was performed through the contract method by the brigade Hero of Socialist Labor V. Kazakov from PMK-181 of the Kaluga building administration. Now the specialists of the center are installing and setting up the perforated tape apparatus and the "Minsk-32" computer which in the future will be supplemented by the more advanced SEV (Council for Mutual Economic Assistance) machine "YeE S-1035," which is the only one in the nation. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 17 Oct 79 p 2] [52]

CSO: 1863

III. SOCIOCULTURAL AND PSYCHOLOGICAL PROBLEMS

A. Education

USSR

IMPROVE THE TRAINING OF SPECIALISTS IN COMPUTER PROCESSING OF ECONOMIC DATA

Moscow VESTNIK STATISTIKI in Russian No 9, Sep 79 pp 21-25

MOROZOV, V.

[Abstract] Successful establishment of an Automated System of Government Statistics (ASGS) will largely depend on the skill and the experience of specialists engaged in the project as well as on the organization of their effort at the various planning levels. Among the specialists on this project are graduates of the Moscow Institute of Economic Statistics, and students of the "Organization of Mechanized Processing of Economic Data" (OMOEI) study course. In order to better prepare the cadres for their task, this study course was revamped in 1977 by addition of "Automated Management Systems" and various other specialty disciplines in the fields of socio-political science, mathematics, engineering, economics, and others broadening the educational profile of students, also a sequence of application and system programming including the principles of algorithmization. The student thus learns about theoretical and practical problems in constructing integrated systems for computer processing of accounting-planning and statistical data, about simulation of software quality and reliability, about automation of the design of economic data processing systems, and about design and operation of complex economic systems from the engineering-technical standpoint. Much attention is paid to improvement of the training level and wide use is made of computer-aided programmed instruction in individual disciplines. Here an important role is played by the data base and the organization of assignments, using not only conventional languages (ALGOL 60, FORTRAN, PL-1) but also nonprocedural formats. The course is designed to train specialists adequately, taking into consideration that the development cycle for an automated enterprise management system (ASUP) as well as for the Automated System of Government Statistics, the second generation of which is to include seven functional starter subsystems, is 3-5 years. Attention is also paid to computer-aided solution of problems in data processing, mathematical simulation, and programming. For effective instruction in all the areas, various scientific-industrial centers are contributing their resources: Main Computation Center, the Scientific Research Institute, and the All-Union State Design-Technological Institute at the USSR Central Statistics Administration, as well as others.
[42-2415]

2415
CSO: 1863

B. Labor and Management

UDC 681.3:658.387

COMPUTER CONTROL OF THE PROCESS OF LABOR PRODUCTIVITY GROWTH

Kiev MEKHANIZATSIYA I AVTOMATIZATSIYA UPRAVLENIYA in Russian No 3, 1979
pp 9-13 manuscript received 20 Mar 78

[Excerpts from the article by A.A. Alekseyenko, V. M. Krishtop and P. O. Kutsyy, engineers]

[Exerpts] A system for controlling the process of labor productivity increase using the "Minsk-32" computer has been developed and introduced at one of the enterprises.

The system provides for planning the level of labor productivity in progressive achievement stages for each worker, daily accounting of the output achieved, calculation of the pay scale and the amounts of the current bonus payments based on the totals for the performance of plan assignments and the assignments for the progressive achievement stages, an analysis of the work totals for a month, and the organization of brigade work with wage distribution taking into account the labor participation factor (KTU).

The economic savings from the introduction of the system, which were achieved as a result of increasing the rates of labor productivity increase, amounted to about 80,000 rubles annually.
[45-8225]

8225
CSO: 1863

C. Artificial Intelligence

A COMPUTER IS TAUGHT TO THINK

Kishinev SOVETSKAYA MOLDAVIYA in Russian 14 Sep 79 p 4

[Article]

[Text] An unusual press conference was being held in L'vov University's Computer Center. TASS Correspondent Yu. Romanov's questions were being answered by...a computer.

"Who is Sasha?" "Sasha is a man," answered the electronic interlocutor. "What can a man do?" "A man can think." "Can a computer think?"

Professor M. Derkach, chief of the Department of Biophysics and Mathematical Methods of Biology, hurried to the computer's aid: "In the near future--yes."

For more than 20 years, work on teaching computers to understand human speech has been going on at the university. Specialists in the department developed their own computer model that can, with the help of a speech synthesizer, reconstruct words, combinations of words and even entire phrases.

"Together with other scientific research institutes," stated M. Derkach, "we are now working on the introduction in the L'vov production association 'Elektron' on the first device for the oral input of information into a computer. It will make it possible to converse with a computer, using simple sentences."
[80-11746]

11746
CSO: 1863

"PIONEER" COMPUTER PLAYS CHESS

Moscow STROITEL'NAYA GAZETA in Russian 28 Sep 79 p 4

[Interview by V. Sharlot: "'Pioneer' is Fully Educated"]

[Excerpt] We are speaking with the ex-champion chess player of the world, M. M. Botvinnik, doctor in technical sciences and the manager of the Section for Developing Algorithms and Programs for Complex Problems of the All-Union Scientific Research Institute of Electric Power.

Question: Mikhail Moiseyevich! Recently your books "On solving imprecise sorting problems" and "To achieve the goal" were published in which considerable time was devoted to the problem of an artificial chess player.

Answer: The "Pioneer" program is fully prepared to be debugged. This would require about 20 years on a small capacity computer. Therefore, it is necessary to use a powerful computer. In that case, about 6 months of work will do it.

Question: It is well known that, so far, the machine has played like a second rate player. It is assumed that the new program makes it possible to play like a master. What is the difference between these programs and how was it possible to achieve this progress?

Answer: All playing programs, so far, have been based on a method of a full selection of moves with some mathematical changes of this method. Various positions of six half-moves (three full moves) were analyzed to the maximum in the middle of the game, and a greater number in the end game. In this case, up to a million moves were studied.

The "Pioneer" program implements only a partial selection, considers only sound versions and discards the ones not needed. This increases the efficiency of the selection.
[103-2291]

2291
CSO: 1863

IV. INFORMATION SCIENCE

A. Information Services

UDC 658.012.011.56:681.3

DATA TRANSFER FROM SECOND TO THIRD GENERATION COMPUTERS

Moscow MASHINOSTROITEL' in Russian No 8, 1979 pp 32-33

[Article by I. M. Demin, L. Sh. Semyenova and P. R. Shershnev]

[Text] At the start of 1969, a data computer center (IVTs) based on the "Ural-11B" computer was established at the Perm' Telephone Plant. The preparatory work on the introduction of an automated production management system (ASUP) had been done since 1968. At the end of 1972, an interdepartmental commission accepted the first stage of the ASUP. By that time, complex and cumbersome work was done on preparing the algorithms, developing program software for the ASUP and various coders for production data.

The basic direction of the activity of the computer center was for the following ASUP subsystems:

management of technical preparation for production;
technical economic planning;
accounting;
material-equipment supply management;
operational management of basic production;
management of sales;
auxiliary production management;
norm-reference services.

The indicated subsystems includes 37 problems which are to this day solved by the "Ural-11B" computer and according to which plant shops and services obtain tabulator printouts.

This work continued in the following years. In 1977, the plant began operating the second stage of the ASUP. Now the computer center solves 59 problems in ten subsystems and issues about 140 kinds of tabulator printouts to shops and departments.

The following coders were developed at the plant: materials, purchased products, trade skills, equipment, data stores, etc. On the basis of the punched card models developed, the following data files were established on magnetic tapes: material prices, purchased products prices, finished products prices, norms for material consumption for parts, time and cost of operation norms, composition of products, formulations of complex materials, norms of material consumption per unit area of coating, norms for auxiliary material consumptions, operational composition of trade skills and equipment.

The following operations are performed on the basis of norm data in the computer: preparation of design-technological specifications for products; calculation of the applicability of parts and units in products; preparation of material consumption norms per product; calculation of summary material norms per product; formation of a price list; calculation of summary norms for production time, and the cost of parts and products for shops and the plant as a whole.

When the second stage of the ASUP was introduced at the plant, the possibilities of the "Ural-11B" computer were utilized fully. Therefore, for the further development and improvement of the automated production management system, the YeS-1020 was acquired and put in operation. This made it possible to expand the range of problems being solved and provided for considerably greater possibilities.

At the same time, it became necessary to find an efficient method to transfer the data from the second generation computer to the third generation type YeS computer, because the usual method for forming the norm base for the YeS-1020 machine requires a great deal of manual labor and machine time and, moreoever, does not fully insure the authenticity of the transferred data.

Inasmuch as there are no devices for punched card and punched tape read-out in the basic "Ural-11B" computer, the usual method for transfering norm data from this machine to the YeS01020 computer is by the read-out of data by an alpha-numeric printer (ATsPU) with the following preparation of punched cards or punched tapes.

A great number of automated enterprise management systems function in our country based on second generation computers. In connection with the changeover to the series production of the third generation computers of the YeS type, the ASUP developers were faced with two basic problems.

The first -- to preserve the accumulated software of the functioning ASUP. This problem was solved to a certain degree for the software of the systems established on the basis of the "Minsk-32" computers, using the previously developed programs on the YeS-1035 computer. In other cases, the preservation of second generation computer

software and its transfer by the classical method of reprogramming to type YeS computers are unsuitable in view of the considerable labor involved. Modern ASUP are developed on a norm base that provides for a better method of storing norms (data bank) and a modern use of mathematics employing operational systems.

The second -- to implement in a short time and with full autheticity the transfer of checked-out and finished-off norm data from magnetic tapes of the second generation computers to magnetic tapes of the third generation computers. So far, this problem had still not been solved uniquely,and moreover, there are no acceptable solutions for recording large masses of data insuring the authenticity of data transfer and with sufficient speed.

We developed an automatic method for transfering data which replaced the semiautomatic method for transferring norm-reference data from magnetic tapes of the "Ural-11B" computer to the magnetic tapes of the YeS-1020 computer. This made it possible to increase the productivity of labor, eliminate manual labor for preparing data, perforation of tapes and monitoring the data after perforation and after recording on magnetic tapes, reduce machine time, reduce materials and electric power consumption, achieve the maximum speed of the system for transferring data from one computer to another and provide for the maximum authenticity of the transferred data.

This method of data transfer provides for the transfer of one byte of data from the magnetic tape immediate-access device (MOZU) of the "Ural-11B" computer to the immediate-access device (OZU) of the YeS-1020 computer with a speed of from 800 nanoseconds to 600 milliseconds (depending upon the speed of the second generation computer). The transfer time of one byte from the "Ural-11B" computer is 250 to 300 microseconds.

The recording of data from one computer to another is done through a device of the basic set using a special conjunction unit fed by controlling and data signals (Fig. 1).

The "Ural-11B" and YeS-1020 computers are operated simultaneously in the expectancy mode by control programs. In the full cycle of transfer, the data are readout of magnetic tapes U-445 and U-435 and proceeds to processor (U-328, U-451), then through the conjunction unit to the YeS-6022 device for punched tape input, to the YeS-2420 processor and is finally recorded on the YeS-5010 magnetic tape.

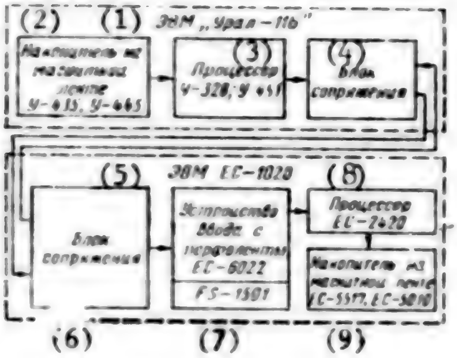

Fig. 1. Block diagram of apparatus conjunction between the "Ural-11B" and the YeS computers

1. "Ural-11B" computer
2. Magnetic tape memory U-435, U-445
3. Processor U-328, U-451
4. Conjunction unit
5. YeS-1020 computer
6. Conjunction unit
7. Ye-6022 read-out device from magnetic tape; FS-1501
8. YeS-2420 processor
9. Magnetic tape memory YeS-5517, YeS-5010

The "Ural-11B" computer is joined to the YeS-1020 computer, by a channel for data transfer to external devices using instructions for transferring the data to a punched tape. The YeS-1020 computer is joined to the "Ural-11B" computer by a channel to read-out the data by means of a photoreader device FS-1501. With these connections of the two machines, it is assumed that the entire YeS-1020 computer is a device for the "Ural-11B" computer for putting the data on a punched tape and the entire "Ural-11B" computer is a device for this machine to read-out the data from the punched tape. Thus, slow acting and unreliable mechanical devices are eliminated in this block diagram, and make it possible to transfer data from one computer to the other by a fast acting processor.

The conjunction unit represents a combination of two arrangements: one is in the "Ural-11B" computer processor, in devices U-328 and U-451, while the other is in the YeS-6022 device for input from perforated tape of the YeS-1020 machine. Both computers are connected by a shielded cable with 12 conductors, 8 of which are for transmitting data and the rest are for service purposes.

The algorithm for transferring data on the equipment and program level is shown in Fig. 2.

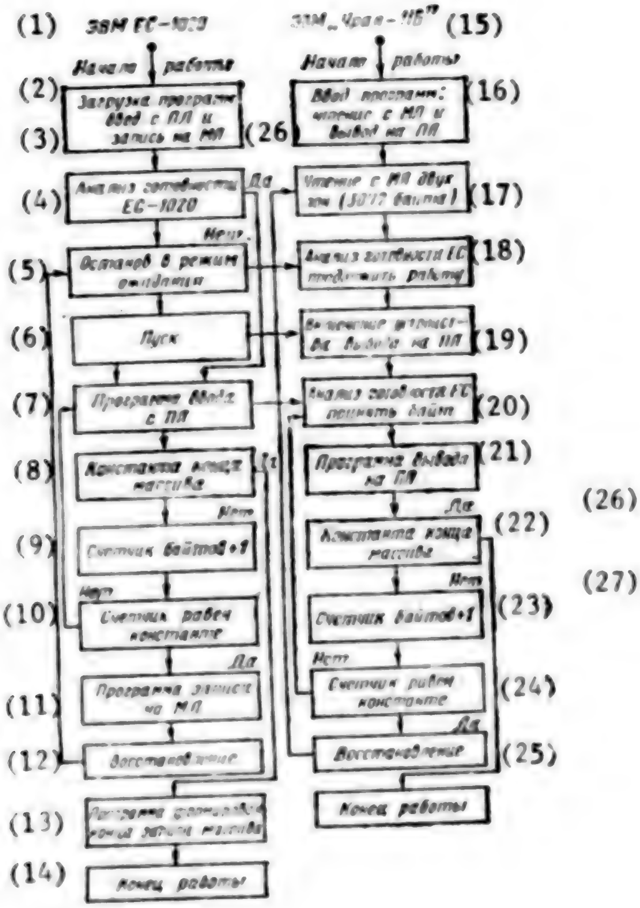

Fig. 2. Algorithm for data transfer from the "Ural-11B" to the YeS-1020 computer on the equipment and program level.

1. YeS-1020 computer
2. Start operation
3. Program loading: input from PL(punched tape) record on ML (magnetic tape)
4. Analysis of YeS-1020 readiness
5. Stop in the expectancy mode
6. Start
7. Program for input from PL
8. Constant of end of data file
9. Counter of bytes + 1
10. Counter equal constant
11. Program for recording on ML
12. Retrieval
13. Program for forming the end of the data file recording
14. End of operation
15. "Ural-11B" computer
16. Program input: read from ML and output to PL
17. Read from ML of two zones (3072 bytes)
18. Analyze readiness of YeS to continue operation
19. Connect device for output to PL
20. Analyze readiness of YeS to accept bytes
21. Program for output to PL
22. Constant of end of data file
23. Counter of bytes + 1
24. Counter equal constant
25. Retrieval
26. Yes
27. No

This principle of rerecording is used successfully in rerecording large data banks from such machines as the "Ural-14," "Ural-16," "Minsk-22," "Minsk-32," M-220, etc. to any computer of a single series.

Two programs were developed for transferring data from magnetic tape of the "Ural-11B" computer to the magnetic tape of the YeS-1020 computer:

program 1 -- data read-out from the "Ural-11B" computer;

program 2 -- data input to the 1020 computer.

Program 1 is written in the "Ural-11B" machine language, while program two is written in the ASSEMBLER language, the DOS/YeS (version 1.3) operational system.

The following external devices are needed for program 1:

- punched tape input devices;
- magnetic tape memory;
- alpha-numeric printer

The following devices are needed for program 2:

- punched card input device;
- punched tape input device;
- alpha-numeric printer;
- magnetic tape memory;
- magnetic disc memory;
- "Konsul" typewriter.

These programs are designed for transferring data with any structure of a fixed length record. The data files obtained on the magnetic tape of the YeS-1020 computer are sequential data files with interlocking fixed length records and standard tags.

In program 1, the first punched card is the controlling one. It indicates the number of the tape-pulling mechanism on which the magnetic tape with the data file to be rewritten is located; the zone number from which the data is to be rewritten; the number of full words in the record of the data file to be rewritten; the length of the record of the data file being created; the tag of the end of the data file being rewritten. Moreover, a table of the record structure of the data file is given. The recoding of codes and the alpha-numeric data is done in accordance with various algorithms.

In program 2, there are also punched cards which indicate the length of the record and the length of the data file blocks, recorded on the magnetic tape of the YeS-1020 computer.

Both programs operate simultaneously. The monitoring summation is done by bytes. The monitoring sums are printed as the data is transferred and afterwards. A consolidated block diagram of the program operation is shown in Fig. 3.

By using these programs, the following data files can be rewritten, in no more than 2 years: assembly specifications, labor per operation, material prices, material codes, data on sets of parts, etc. needed for functioning of the enterprise management system.

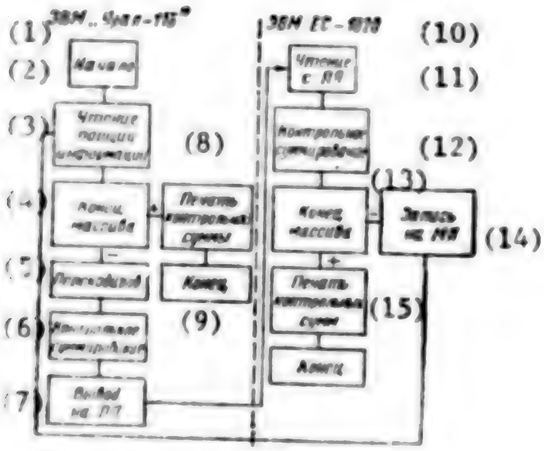

Fig. 3. Consolidated block diagram of program operation.

1. "Ural-11B" computer
2. Start
3. Read portion of data
4. End of data file
5. Recording
6. Monitoring summation
7. Output on PL (punched tape)
8. Print monitoring sum
9. End
10. YeS-1020 computer
11. Read from PL
12. Monitoring summation
13. End of data file
14. Record of ML (magnetic tape)
15. Print monitoring sums

The duration of transferring data from one computer to another is related to the necessity of a transition period for transforming ASUP problems created on the "Ural-11B" base to the YeS-1020 computer, but on a higher organizational and theoretical level using a data bank, taking into account the accumulated experience in developing and operating the ASUP.

In the transition period, one part of the problem is solved on the "Ural-11B" computer and the other part -- on the YeS-1020 computer, using the same norm base created on the magnetic tapes of the "Ural-11B" computer. This eliminates duplicating data files which are constantly being corrected depending upon actual production conditions.

The developed programs provide for forming machine words, grouping of data files, recoding, transfer, monitoring summation and obtaining information confirming the completeness and authenticity of the data transferred from the "Ural-11B" to the YeS-1020 computer.

The considered device-program method for transferring data may also be used for transferring data from the computer of one system to computers of the second generation, i.e., in the reverse direction.

The economic effect of implementing this proposal at our plant amounted to about 20,000 rubles.

[104-2291]

2291
CSO: 1863

V. THEORETICAL FOUNDATIONS

A. General Problems

UKRAINIAN SSR INSTITUTE OF CYBERNETICS PERFORMS WELL

Vil'nyus SOVETSKAYA LITVA in Russian 16 Aug 79 p 4

[Caption and photograph]

[Text] During the 10th Five-Year Plan the collective of the Order of Lenin Institute of Cybernetics of the Ukrainian SSR Academy of Sciences has carried out a number of pure and applied scientific investigations aimed at development and broad introduction of highly efficient sets of hardware and software for automated design, control, and data processing systems.

Several of the Institute's most important development projects have received State Prizes of the USSR and Ukrainian SSR in the field of science and technology.

The photograph shows the machine room of the computing center of the Institute of Cybernetics.
[24-11,176]

11176
CSO: 1863

UDC 621.396.666

SYNTHESIZING AN OPTIMUM DIGITAL LEVEL STABILIZER

Leningrad IZV. VUZ: PRIBOROSTROYANIYE in Russian No 8, 1979 p 34 manuscript received 15 Feb 79

[Abstract by Yu. M. Korshunov, A. V. Simkin and B. A. Makarov, Ryazan' Radiotechnical Institute]

[Text] The authors present a technique for synthesizing an optimum digital level stabilizer acted upon by distorting interference that utilizes the method of recursive digital filtration. Using the criterion of the minimum mean square of the error, they find an algorithm for generating the controlling effect on the stabilizer's gain factor.
[105-11746]

11746
CSO: 1863

UDC 681.513:007.52

ON METHODS OF CALCULATING THE ORIENTATION ANGLE OF A PART FOR CONTROL SYSTEMS OF ADAPTIVE INDUSTRIAL ROBOTS

Leningrad IZV. VUZ: PRIBOROSTROYENIYE in Russian No 8, 1979 pp 37-41 manuscript received 6 Oct 78

[Abstract by M. A. Gladshteyn and V. M. Komarov, Rybinsk Aviation Technology Institute]

[Text] The authors discuss methods of calculating the orientation angle of parts. They propose a method for calculating the orientation angle that utilizes circular scanning and is invariant to displacement of the center of scanning relative to the part's center of gravity.
[105-11746]

11746
CSO: 1863

B. Automatic Control and Control Systems

UDC 621.394.74

COMPUTING CONNECTEDNESS CHARACTERISTIC IN REDUNDANCY NETWORKS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, 1979 manuscript received 3 Feb 78; after completion 10 Oct 78 p 14

[Article by V. A. Gadasin and A. S. Lakayev: "The Technique of Linear Complexity for Estimating the Reliability Characteristics of Redundancy Communications Networks"]

[Excerpt] The proposed algorithm makes it possible to find the probability characteristics of the redundancy communications network with homogeneous structures that are frequently encountered in practice. The type of characteristic being sought is determined depending on the type of subset of objects whose probability of connectedness is being established. If the subset conset consists of two objects, then its characteristic is the probability of a connection (the existence of a route) between the objects. If the subset coincides with the entire set of objects of the network, its characteristic is the probability of trouble-free functioning. The algorithm may be set forth almost verbatim for the case of determining the mathematical expectation of the number of objects connected to the given object. The algorithm insures finding the characteristics of connectedness with a complexity on the order of $O(N)$ where N is the number of objects in the network.

Precision may be increased by considering <k> sets of a larger order formed by channels surrounding four, five, and so on adjacent objects. Such expansion follows from the description of the algorithm in an obvious manner.

Realization of the algorithm in the form of a set of programs is quite clear and requires on the order of $(1\text{-}1.5)\times 10^3$ statements in the PL-1 language. It takes about one hour on a YeS-1040 computer to compute the probability of connectedness of a redundancy network with 100 objects and 200 channels.

The speed of computing characteristics makes it realistic to synthesize large-dimension redundancy communications networks on medium-class computers. This is because, as a rule, the synthesis is accomplished by a local modification of the structure obtained at each step. It

follows from the description of the algorithm developed that in this case only a small number of the possible <k> sets will be counted over, which results in a constant complexity of recounting the characteristics of the variation under study. Therefore, it is possible to consider a large number of different variations of structure, which is fundamental for synthesis.

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VI. GENERAL INFORMATION

A. Conferences

COMPUTERS IN OPERATION

Moscow ZHILISHCHNOYE STROITEL'STVO in Russian No 9, 1979 p 30

[Article]

[Text] An international exhibition "Equipment of the Unified Computer System and Minicomputer System and Their Applications," at which large computers and minicomputers on a single crystal were presented, which were developed jointly by specialists of socialist countries, was held at VDNKh [Exhibit of Achievements of the National Economy of the USSR (Moscow)] in June-July at the intersector pavillion "The Chemical Industry."

The exhibition, dedicated to the 30th anniversary of the Council for Mutual Economic Assistance, related the use of electronics and automated management systems (ASU) in various sectors of industry, including builders in the Peoples Republic of Bulgaria, the Hungarian Peoples Republic, the German Democratic Republic, Cuba, the Polish Peoples Republic, the Socialist Republic of Rumania, the USSR and CSSR. It included three sections: technical, systems and maintenance of computer equipment. Thus, six models of the unified computer system--the YeS-1045 and YeS-1060 from the USSR, the YeS-1025 (Polish Peoples Republic and CSSR), the YeS-1015 (Hungarian Peoples Republic), the YeS-1055 (GDR) and YeS-1025 (CSSR)--and five minicomputers--the SM-1, SM-2, SM-3 and SM-4 (USSR) and SM-52 (Hungarian Peoples Republic) and also the two-machine VK-2-R-60 computer complex constructed on the basis of the YeS-1060 were exhibited in the technical section.

Computers of the engineering section comprised the multimachine computer center, by means of which various automated management systems of all levels were demonstrated in the systems section of the exhibition.

Peripheral devices connected to the computers and which thus permit display of demonstration problems, which are different fragments of real problems, were installed on the stands of the systems section. The systems section was subdivided into several subsections: ASU of central and territorial management bodies, sector ASU, enterprise ASU, ASU for technical processes, automated planning systems and the use of computers in science. A demonstration of dialogue systems of interaction with computers and remote

processing systems and also the capabilities of integrating the YeS EVM [Unified Computer System] with minicomputers occupied an important place in the section. New operational systems and applied program packets of different designation were also demonstrated here.

Such was the system for automated formation of planning decision of construction objects Forproyekt-YeS, which is used in planning single-story buildings of different functional designation and its individual subsystems--when planning the most universal objects.

The Forproyekt-YeS system is designed for automated development of optimum planning decisions at TEO [Technical and economic substantiation] and TP [Technical regulations] stages. The system is oriented toward operational support of designers of dependable information on the properties of the developed versions of planning decisions at the level of sketch development. Use of the system permits the authors to find an effective planning solution as a result of sequential development of all three variants. The Forproyekt-YeS system has been introduced at a number of planning organizations of the country with a significant saving.

The attention of the builders was attracted to the exhibition of applied program packets for automation of design of reinforced concrete members of surface and underground structures in industrial and civil construction (PPP APZhBK), the purpose of which is to automate work on design of reinforced concrete structures. As shown on the stands, such unique buildings and structures as the Ukraina Concert Hall, the Institute of Technical Information and the Severnyy Bridge at Kiev and the Olympics Cycling Track at Krylatskoye (Moscow) were constructed by using the indicated packet, as demonstrated on the stands. Use of the packet reduces the planning deadlines by a factor of 5-7 and consumption of material resources by 5-10 percent. The results are issued in tabular form and are supplied with the customary indexing. The value of using YeS EVM both in one country and in combination in all the socialist countries is very obvious.

Organization of a system of complex centralized servicing of equipment was demonstrated in the third section of the exhibition--servicing of computer equipment. The results of the joint efforts of the participating countries in solution of the problem on development and use of YeS EVM hardware--the Unified system for automation of computer equipment design (YeSAP EVT)--is noteworthy. Introduction of the YeSAP EVT into practice permits a 10-20 percent reduction of the time required to design an EVT for those desiring to introduce a computer complex into operation and to reduce by 30-50 percent the time of technological preparation of production.

The exhibition showed that the use of equipment of the unified computer system and the minicomputer system in the national economy of the socialist countries permits an increase of production efficiency, including that of housing-civil construction.
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A SCHOOL FOR CYBERNETICS

Tashkent PRAVDA VOSTOKA in Russian 14 Oct 79 p 3

[Article, Uzbek News Agency]

[Text] The Fourth All-Union School-Seminar on Computer Networks was held in Tashkent. It was conducted by the USSR Academy of Sciences' Scientific Council on the Complex Problem of Cybernetics, and its active participants included representatives of a number of academic and departmental scientific research establishments from throughout the country, as well as the Cybernetics Scientific Production Association of the Uzbek SSR Academy of Sciences.

Over the course of 2 weeks the attendees, who traveled to the capital of Uzbekistan from many fraternal republics, studied an extensive circle of problems related to the principles of the organization and administration in computer networks and methods of modeling them, the formulation of problems, and the construction and analysis of data transmission systems. [80-11746]

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B. Personalities

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Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 3, 1979 p 112

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C. Publications

UKRAINIAN ENCYCLOPEDIA OF CYBERNETICS

Kiev VISNIK AKADEMIYI NAUK UKRAYINS'KOYI RSR in Ukrainian No 5, 1979 pp 76-78

[Article by Yu. O. Mitropol's'kyyi, academician, Ukrainian Academy of Sciences]

[Text] Cybernetics has been an independent field of science for three decades. In the last two decades, however, it has undergone extremely rapid development and has perhaps penetrated into all fields of science, technology, the national economy, enriching them with principally new methods and means--systems, machines and devices.

Cybernetics has been shaped as a broad scientific trend that incorporated methods of many scientific disciplines, synthesized them and enriched them with new ideas. Assimilation of its stockpile of knowledge is a vital task for everyone who has some dealings with control processes, tackles problems of optimization or bases their practical activities on methods of cybernetics--computers, control devices and equipment. Even the experts have a hard time understanding and orienting themselves in the vast amount of literature from cybernetics and the allied mathematical, technical and economic disciplines and finding the necessary information therein.

Hundreds of thousands of experts needed guidance to help them navigate in the limitless sea of cybernetics. This guidance was established: in 1973-1974 the two-volume "Encyclopedia of Cybernetics" was published in both Ukrainian and Russian.

This publication, unique in domestic and world literature, encompasses the important theoretical trends of cybernetics and the fundamental sciences associated with it (mathematics, radio electronics, etc.). It reveals the essence of its numerous uses in various fields of science, technology, production and shows the leading role of domestic scientists in establishing this field of knowledge. The scientifically valid meaning of cybernetics as a science of general patterns of collection, storage, transmission and conversion of information in composite control systems which has crystallized with years of experience. Here can be found clear demarcations and exhaustive explanations of the basic divisions and trends: theory, economics, technology, biology, medicine, computer technology, etc.

A great deal of work was done in compiling the encyclopedia to collect, systematize and standardize the basic terms and concepts of cybernetics and its allied sciences. The two-volume work is a contribution to the evolution of the terminological lexicon, especially Ukrainian terminology in the field of cybernetics.

The encyclopedia is designed for a wide range of specialists of the most wide-ranging fields of science, technology and national management.

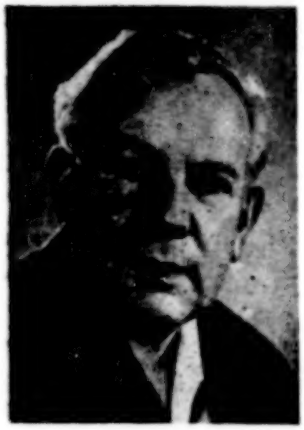
The "Encyclopedia of Cybernetics" entailed the participation of more than 600 scientists and specialists of various fields of science and national management from 102 organizations, institutions and enterprises of the country, in addition to the authors, editors and consultants.

The editorial board was faced with coordinating the activities of this enormous group, elaborating and maintaining standard methodology throughout the entire edition and explaining the achievements and problems of cybernetics from modern standpoints--and much more.

Attempts had been made to create such an encyclopedia, but it was only the group of the Kiev cybernetic school, founded by academician V. M. Glushkov, that was able to carry it through, sum up of the achievements of cybernetics (in other words, all the trends of this multidisciplinary science now represented in the republic) and to devise, systematize and explain its achievements and problems using standardized methodological assumptions.

For many years of tremendous effort, especially by members of the editorial board, the Ukrainian State Prize was awarded to academicians M. M. Amosov, I. M. Kovalenko. V. S. Korolyuk, O. I.Kukhtenko, corresponding member K. L. Yushchenko, doctors in technical sciences V. A. Kovalevs'kiy, V. M. Kuntsevich, Z. L. Rabinovich, doctor in physical-mathematical sciences B. M. Pshenichniy and candidate in technical sciences P. V. Pokhodzilo.

Each member of the group was a scientific adviser of some trend, a topical section of cybernetics, and at the same time penned articles, was a consultant or editor of allied sections, formed an author's group for his section, found editors and consultants, etc. This valuable scientific research publication is the result of the tremendous efforts of the entire group as well as coworkers of the Head Editorship of the Ukrainian Soviet Encyclopedia.



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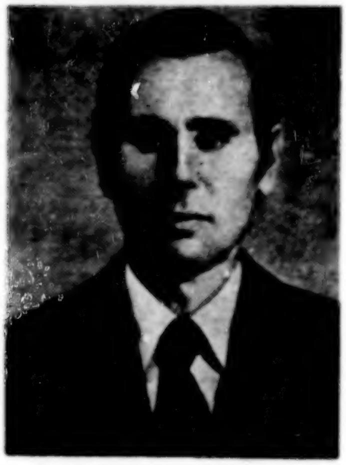

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